WORLD GEOGRAPHICAL ENCYCLOPEDIA

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VOLUME 5

OCEANIA

POLAR REGIONS

GENERAL GEOGRAPHY

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INTRODUCTION

THE "NEWEST WORLD"

In dividing up the Earth into continents or parts of the world it has been the established custom to list Europe first and Oceania last in accordance with a ranking of frankly Eurocentric perception. This is certainly not devoid of historical logic since Europe was the point of departure for the discovery and conscious unification of our planet. Hence, the chronological succession of Old World, New World, and Newest World, to which have been added the polar regions (absolutely the last "unknown lands") and even more recently the ocean depths—almost a "submerged continent" in themselves—and outer space, now crisscrossed by artificial satellites and, in fact, annexed to the "anthroposphere."

The last volume in this Encyclopedia is therefore intended to host the last "continent," Oceania, as well as the polar regions, which remain the most peripheral areas of our planet and the least inhabited: in fact, these are the only truly deserted areas left, veritable "nonecumenical" zones practically removed from the pervasive human colonization of all space on Earth.

In reality, Oceania is more than a continent. It is the sum of the smallest continent proper, Australia, plus an aggregation of islands scattered (mostly in tiny clusters) throughout the immensity of the largest ocean on Earth—the Pacific. Ranging over an area of 73 million mi^2 [190 million km^2], Oceania covers practically two fifths of the entire planet, yet as much as 70 million mi^2 [180 million km^2] encompasses the waters of the Pacific and less than 3.8 million mi^2 [10 million km^2] is land (with Australia occupying some 2.9 million mi^2 [7.7 million km^2] alone). The great void of this part of the world is also reflected by its very small population: less than 30 million people, most of whom came from Europe (a smaller number from Asia) and supplanted (almost to the point of causing them to disappear) the native Aborigines, Melanesians, Micronesians, and Polynesians. In certain respects, the Oceania region—Australia and New Zealand, in particular—are still areas of "white" conquest, as was the American West a century ago, even if settlements and economic structures have reached mature and, in some cases, advanced forms. The similarities also extend to the cultural mix of immigrants and the dominant Anglo-Saxon element which controls their merger. In fact, they are modeled more on the American than the British prototype, as are also the lifestyle and proud self-awareness of the more advanced countries. The exoticism of the Pacific islands is an attraction for tourists, with Hawaii being the international showcase.

The isolation of this newest continent is constantly being reduced by modern means of communication and transportation as well as by the growing economic importance of the countries around the Pacific rim (especially the U.S. and Japan). With the technologically most advanced regions of the world fiercely competing for the conquest of new markets, the Pacific area is exercising a new gravitational pull on the political and economic design of today's world.

THE POLAR REGIONS

The process of demarginalization of large peripheral areas also extends today to the polar regions which are without doubt the most inhospitable on Earth. Europe, Asia, and North America all front on the Arctic Ocean, which explains the growing importance of the polar air routes that have for some years now linked the Far East to Canada and the United States. The division of the world into two political blocs also heightened the strategic military importance of the Arctic Ocean, under whose ice crust nuclear submarines with a wide cruising range have been navigating.

The isolated Antarctic continental landmass, on the other hand, has held a different interest for a variety of countries which have had their eyes on it since the beginning of the 20th century, notably the closest South American countries (Chile and Argentina) as well as Great Britain, New Zealand, the former Soviet Union, and the U.S. The territorial designs aroused by the potential exploitation of as yet unassessed mineral and energy resources have yielded to more rational scientific goals regulated by international treaties, resulting in the establishment

of research stations and laboratories to study the great variety of physical, geodynamic, geomagnetic, and atmospheric phenomena involved in the increasingly urgent need to understand and control the ecological balance on a planetary scale (typical are the studies of the ozone layer and the so-called "greenhouse effect"). Other nations—like Japan, Italy, and France—have joined those which have already advanced their Antarctic claims, in what has become a peaceful competition. For the first time in human history, the interests of the planet as a whole have been put before those of individual countries, even if the disputes involving Chile, Argentina, and Great Britain (the latter in the Falkland Islands) can certainly not be regarded as resolved. At any rate, the resources of the Antarctic are still intact or, as in the case of whaling, have in recent years been governed by international norms.

THE RESOURCES OF THE PLANET

The South Pacific and the polar regions in the Arctic and Antarctic contain what are probably the most precious resources for future generations—renewable resources such as algae and water, which in the near future will become more important than traditional resources (in which these areas of the world also abound). But a reference work such as this, in addition to describing the individual continents and countries of the world, must also include the general characteristics and resources of our planet.

The knowledge we have acquired since the European Age of Discovery is now so vast that it must be constantly updated and organically systematized to take into account global data referring not only to physical features (land, oceans, rivers, climates) but also above all to anthropic and economic factors. In the past century these data have accumulated at an impressive rate never before reached in human history.

Although the physical features have evolved slowly, in accordance with a pace sometimes in keeping with geological rhythms and sometimes more variably conforming to climatic changes, they are increasingly influenced by human factors, to which effects are attributed that are capable of major repercussions involving the Earth's entire ecosystem. One need think only of the soil, water, and air pollution that has altered—and is increasingly altering—the balance in the biosphere. Think of the destruction of the tropical forests and the resulting depletion of the animal species that inhabit them, or of the desertification of tropical regions due to overcultivation, or of the risks of an abnormal "greenhouse effect" due to excessive gas emissions into the air, or of the gradual exhaustion of non-renewable resources such as oil, or of the devastating effects of radiation emanating from nuclear reactors, and so on.

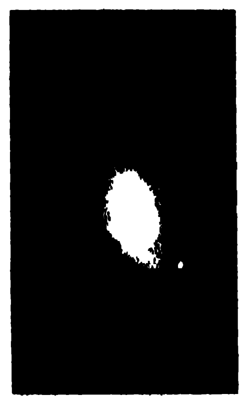
These are phenomena triggered by technological and economic progress which benefits only a minority of the Earth's population, but whose negative effects burden all of humanity. They are further aggravated by demographic imbalances which pit the almost exponential increase in Third World populations against the stability of the rich nations.

The economic production statistics, broken down according to major categories (food, energy, industry, mining, etc.), provide even greater evidence of the disparities between the countries which produce raw materials and energy resources and those which transform them into finished products, deriving from this considerable added value and competing for their distribution in the world's markets. The most significant and dramatic confirmation of such disparity is found in the social data relating to income, education, health, demographic rate of growth, consumption of capital goods, and the like. These data alone are eloquent testimony to the demarcation between the geography of plenty and the geography of hunger.

A comparative reading of these statistical data will integrate the information of the various phenomena on a planetary scale, facilitate juxtapositions, throw light on interrelationships, and generally contribute to that synthesizing vision which—by placing facts and problems in their spatial and temporal context—constitutes the very essence of geography, a discipline which, in the intricate mosaic of our modern world, can at the very least provide the critical knowledge required if we are to understand and approach our living space correctly.

Umberto Bonapace

General Contents



Note All conversions of metric system (SI) units have been rounded off and detailed data may not add up to the totals given Unless otherwise specified, tons (t) refer to U S short tons In the designation of natural features and place names the local spelling has been retained (or transliterated in Romanized form), except in cases where an English-language conventional spelling is commonly used

OCEANIA

Unlike the other parts into which the Earth is usually divided, Oceania does not consist of a continuous expanse of dry land, but is fragmented into island groups dispersed across the Pacific Ocean, which occupies almost an entire hemisphere of our planet. However, Oceania is usually considered also to include Australia, which is the smallest of the traditional continents (and the last to be discovered by European explorers), New Guinea, the world's second-largest island, and New Zealand.

As Ilaria Caraci has written:

> *The exploration of the Pacific Ocean, and the demonstration that Terra Australis did not exist, were the great conquests of the 18th century. Once the New World had been Europeanized, the islands of the great ocean became the last frontier of the white man's knowledge and dreams. In 1766 Louis Antoine de Bougainville undertook a voyage of circumnavigation that lasted two years, but on his return France and all of learned Europe were fascinated only by his description of Tahiti, and very soon the island became a myth—that of a primordial paradise of natural beauty, inhabited by a happy and sinless humanity.*

The area of all the lands of Oceania, including Australia and New Guinea (whose western half, Irian Jaya, belongs to Indonesia politically and is therefore included in the Asia volume), is 3,575,100 mi² [9,262,000 km²], or 6.3% of the world's land area. Australia alone accounts for 2,965,000 mi² [7,682,000 km²], and New Guinea for 326,000 mi² [845,000 km²]. The total population is 30 million, or 0.5% of the world's people, with an average density of 8.3 per mi² [3.2 per km²].

Leaving aside Australia, which is obviously considered a self-contained unit, the islands of Oceania, located for the most part in the southwestern sector of the Pacific, are traditionally divided into three groups: Melanesia, consisting of the large mountainous islands extending from New Guinea east to Fiji; Micronesia, with its groups of small islands (predominantly atolls) that stretch from Palau and the Marianas toward Kiribati to the southeast; and lastly Polynesia, the islands of which lie within a great triangle with vertices at Hawaii, New Zealand, and Easter Island.

NATURAL ENVIRONMENT

The small continent of Australia is the linchpin of this part of the world. The island alignments that characterize Oceania originated from movements of the extremely ancient Australian Plate. They form three great arcs extending to the east of Australia. The first consists of the larger islands—New Guinea, the Solomons, New Caledonia, and New Zealand—which formed during the Cenozoic orogeny. The second comprises the islands of Micronesia; and the third and outermost is the Polynesian arc, from Hawaii to the Tuamotu group. These alignments consist of volcanoes, many of them active, which demonstrate the geological youth of these islands. They originated as lava flowing from fractures that now mark the great Pacific deeps and resulted, according to the theory of plate tectonics, from movements of the Earth's crust. A characteristic feature of the intertropical volcanic islands and of the east coast of Australia is the presence of great coral reefs. Aligned to the east of the submarine ridges on which the larger islands stand (from New Guinea to New Zealand) are oceanic trenches—Solomon, Kermadec, and Tonga—that are part of what geologists call the "Pacific andesite line." This line divides the undersea areas affected by continental movements from those that are more intimately linked to the internal structure of the Earth's crust and constitute most of the Pacific Ocean floor.

Geological structure and relief. A distinction must be made between the geomorphological features of Australia—which is of continental size and constitutes a large crustal plate detached from ancient Pangaea, with great plateaus, peneplains, interior basins, and marginal mountain ranges raised by ancient folding (upper Paleozoic)—and those of the other large islands, such as the New Zealand group and New Guinea, whose mountains were rejuvenated by the most recent orogenies (in the Cenozoic) and are therefore higher and more rugged. Features similar to these are present in many Melanesian islands (the Bismarcks, the

Solomons, New Caledonia), while the little islands of Micronesia and Polynesia represent the tops of the oceanic volcanic ridges, sometimes mountainous in shape but more often made up of coral concretions clinging to the summits of volcanic peaks that barely rise above the water.

In Australia the eastern highlands, dominated by the long mountain range facing the Pacific (the Great Dividing Range), rise to little more than 6500 ft [2000 m] (7311 ft [2229 m] on Mt. Kosciusko). Elevations are much higher on the Melanesian islands, including the peaks of the great east–west range that forms the backbone of New Guinea, with many exceeding 13,000 ft [4000 m] (the highest elevation, Mt. Djaja, at 16,498 ft [5030 m], is located in the western, Indonesian part of the island), and those of the smaller islands. The major Polynesian peaks are those of New Zealand, especially those of the South Island (Mt. Cook, 12,346 ft [3764 m]), while on the North Island are several massive but not very tall volcanic formations, such as Mt. Egmont (8259 ft [2518 m]), which is still active. The greatest volcanoes of the Pacific, however, are those of Hawaii, the most famous of which, Mauna Kea and Mauna Loa, are about 13,800 ft [4200 m] high. Also worth mentioning is the Haleakala volcano; its crater covers an area of 19 mi² [50 km²], with a circumference of 20 mi [32 km] and a depth of more than 2700 ft [830 m], and is considered the largest in the world. According to a folk legend passed on by Robert W. Bone:

> *Maui, the legendary hero of ancient Polynesia, is not yet dead. He can still be found on the Hawaiian island that bears his name. In fact, you need only look for him in the place which attests to one of his most epic exploits: Haleakala, the volcano whose summit rises more than 10,000 ft [3000 m] and whose lush slopes are always enveloped in clouds. "Ha-le-a-ka-la"—almost a ritual chant in the Hawaiian intonation—means "House of the Sun," a name that could not be more appropriate for this volcano, from which seems to issue forth, every day at dawn, the most flaming and luminous of stars to launch its daily course through the sky. It is in fact this course, which the demigod Maui regarded as rather too swift, that triggered his anger: the Sun was moving too fast, he believed, for the Earth to derive its benefits from it. Furthermore, the daylight hours were too short to dry out the tapa (a special type of carefully painted and dressed bark cloth) and prepare the evening meal. That is why, according to legend, Maui armed himself with a long rope and climbed up Haleakala before dawn, resolved to slow the unrestrained course of the Sun. Upon reaching the crater, he stopped and waited. When the solar monster arose, unawares, Maui immobilized it with his rope and extorted from it the promise that it would henceforth cross the sky of Hawaii much more slowly.*
>
> *Today, many "pilgrims" still follow in Maui's footsteps and recall his expedition against the Sun.*

Relief on the minuscule islands of Micronesia is insignificant; as noted above, their volcanic nature is often concealed by the coral formations at sea level which often form a typical atoll shape, with a ring of islets surrounding a central lagoon. The Pacific also contains the deepest oceanic trenches on Earth, aligned with the eastern edges of the main island arcs: they include Mariana (36,192 ft [11,034 m]), Tonga (35,693 ft [10,882 m]), and Kermadec (32,954 ft [10,047 m]).

Climate. A true continental climate is present only in Australia, which contains the largest arid regions and deserts in the Southern Hemisphere. The remainder of Oceania, divided into two almost equal parts by the equator, is traversed by the intertropical convergence zone into which the trade winds blow—diverted by the Earth's rotation to the southeast in the Northern Hemisphere and to the northeast in the Southern Hemisphere—with a regularity resulting from the enormous, unobstructed expanse of the Pacific. The tropical latitudes are dominated by anticyclones, which move as they rotate either in the same direction as the trade winds or toward the subpolar latitudes with their dominant low pressure; in the Southern Hemisphere in particular, the prevailing winds in these latitudes are westerly, and are particularly violent along the Antarctic front. The isotherms are also aligned very closely with lines of latitude, with substantial deviations only near the South American coast and with lesser discrepancies in interior Australia.

Temperatures in the intertropical zone are mitigated by the great mass of the ocean and the constant winds; the annual mean is about 81°C [27°C], with minimal seasonal variation. Rain is abundant and evenly distributed throughout the year along the equator, but tends to diminish and acquire seasonal variations beyond the tropics.

Only interior Australia experiences climatic conditions that are frankly continental, with abrupt temperature changes and accentuated aridity. A kind of temperate climate prevails along the southern coast of Australia and more markedly in Tasmania and New Zealand, the only land areas of Oceania that lie beyond the 40th parallel. The entire atmospheric circulation system experiences seasonal modifications as the sun's zenithal position changes.

Hydrography. Sparse rainfall creates desert or semi-desert conditions in much of Australia. Large areas therefore have no outflow and possess only subterranean water resources (Great Artesian Basin) which are used to meet the needs of Australia's large livestock holdings. Only in the southeast, where the combination of trade winds and mountains produces greater amounts of precipitation, is there a hydrographic system, centered around several major rivers which flow down the western slope of the Great Dividing Range; the longest of these is the Darling, 1685 mi [2720 km] long, which drains an area of 351,000 mi² [910,000 km²].

The New Zealand archipelago, on the other hand, is well-watered, especially the South Island, which is exposed to westerly winds; these release moisture on the peaks of the New Zealand Alps and generate short but vigorous rivers that are also fed by glaciers and perennial snows. Numerous small lakes are also present here, often of glacial origin, while hot springs produced by secondary volcanic phenomena are common on North Island.

Fairly well-developed hydrographic systems are also present on Hawaii and the larger Melanesian islands, while on the other islands of Oceania surface watercourses are greatly limited by the small land areas available.

Flora and fauna. Both the vegetation and the fauna are highly unusual due to the great size and fragmentation of Oceania, the long geological isolation of some parts of it, and the difficulty of communicating among the various islands.

Leaving aside the larger territories, it can be said that the flora of Oceania exhibits species typical of Asia or the Indonesian and Malay islands (tree ferns, lianas, bamboo, and orchids), extending for the most part through Micronesia and Melanesia to Hawaii and northern Australia, alongside typically Antarctic and Australian species (casuarinas, acacias, eucalyptus) in Australia and southern New Zealand; forms similar to the vegetation of Africa and South America are not uncommon. There are many endemic species, especially on the more remote islands that have been isolated for long periods of geological time. Conifers (especially *Araucaria*), mangroves, breadfruit trees, various palms, coconuts, bamboo, ferns, and a number of different spice plants are among the most common species in Oceania, although their distribution varies according to the geographic location and elevation of the various islands. The islands with the sparsest vegetation are the Marshall and Gilbert archipelagoes.

The long isolation of Australia from the other continents has led to the survival of extremely ancient animal species that are extinct elsewhere, while numerous species common to the other landmasses are absent. For example, there are no large mammals (except, of course, those imported by European colonists), while certain smaller mammals such as the echidna and duck-billed platypus are unique to the continent, as are its numerous marsupials, including the kangaroo (symbol of Australia) and koala. The fauna exhibit similar characteristics in New Guinea, which is also home to several species of wild dogs, undoubtedly imported from nearby Asia. New Zealand boasts its own peculiar animal species, particularly with regard to birds: these authentic "living fossils" include several flightless species such as the kiwi and the takani, while the gigantic moa is now extinct. Another large flightless bird is the Australian emu. Birdlife is in fact extraordinarily rich throughout Oceania, comprising many unique species and exhibiting enormous variety, especially in New Guinea and the other large Melanesian islands. Lastly, the open oceans and particularly the inland seas sheltered by the coral reefs are home to the most spectacular variety of fishes on Earth The coral colonies themselves, which in this part of the world have created immense formations of exposed rock, are among the most significant manifestations of marine life, unfortunately, they are threatened by pollution caused by humans.

POPULATION

On a global scale, Oceania may appear unusual due to its remoteness from the great centers of world political and economic power, the enormous size of its oceanic expanses, and its tiny population. The value of local products appears negligible compared with high transportation costs, and the local level of economic development is low.

Nevertheless, since Europeans first encountered its indigenous communities, Oceania has gradually become integrated into the world geopolitical system. Initial contacts by Spanish and Dutch explorers in the 15th and 16th centuries were followed by the great scientific voyages of the Englishman James Cook and others over the next two hundred years. At the time, Australia was inhabited exclusively by Aborigines. The physical traits of the Melanesians (so called because of their dark skin color), Micronesians, and especially the Polynesians appeared to represent a complex mixture; the latter (including the Maori of New Zealand) exhibited more homogeneous characteristics, while the Micronesians appeared related to the Polynesians in the east, and to the Melanesians in the west.

As the Pacific islands were gradually explored by Europeans, they were slowly exploited by American and British merchants and whalers, and Britain assumed initial political control over Australia and New Zealand. The 19th century saw an expansion of Christian missionary proselytization originating from Great Britain, the United States, and France, so that today the population of this part of the world, with the exception of New Guinea, is predominantly Christian.

At the end of the 19th century, when the economy of the islands became important and rivalries among the colonizing nations grew sharper, Oceania was ultimately partitioned among Great Britain, the United States, France, and Germany. World War I gave Australia and New Zealand control over German New Guinea and Samoa, respectively, while Japan temporarily occupied the Marianas, the Carolines, and the Marshalls, which were later placed under League of Nations trust administration. During World War II Japan occupied a number of island groups which were liberated by the Americans in 1945. Since then Oceania has gravitated largely into the political and economic orbit of western Europe and the United States, although between the two wars, links with western Europe became less important as many Pacific islands were decolonized. In 1959 Hawaii became the 50th American state, and in 1962 the western part of New Guinea, now called Irian Jaya, was annexed by Indonesia.

Papua New Guinea, the second-largest area in Oceania and with the third-largest population, became independent in 1975. Between 1962 and 1980, Western Samoa, Nauru, Fiji, Tonga, and the Solomons, along with Tuvalu, Kiribati, and Vanuatu, all gained independence. The United States granted special forms of autonomy to the northern Marianas, Palau, the Marshall Islands, and the Federated States of Micronesia. Guam and American Samoa are autonomous (unincorporated) territories, and only New Caledonia and French Polynesia remain part of France as metropolitan overseas territories.

The structure of Oceania's populations reflects their complex origins. Until World War II Australians and New Zealanders were predominantly of British origin. After the war Australia encouraged substantial immigration, and this caused a sharp increase in population and produced a multicultural society, with contributions primarily from Italians, Greeks, New Zealanders, and more recently Asians.

After the massacres and diseases that threatened to exterminate them, the Aborigines, confined for the most part to reservations, are now a small minority of the Australian population. New Zealand, on the other hand, is still predominantly British, although the indigenous Maoris, whose numbers are growing, constitute an eighth of the population.

On the other hand, emigration from many small islands of the Pacific has been and is still substantial, especially from Polynesia but also from Micronesia. Twenty percent of Western Samoa's people have emigrated to New Zealand, while half the population of Wallis and Futuna has moved to New Caledonia. There are twice as many Samoans living in the United States as remain in American Samoa. The native peoples of both New Caledonia and Guam are now minorities.

Area and population

Country (capital)	Area (mi^2)	Population	Density	Year
Australia (Canberra)	2,965,368	17,086,197	5	1990
Melanesia				
Fiji (Suva)	7,054	36,000	103	1990
Papua New Guinea (Port Moresby)	178,656	3,592,900	20	1989
Solomon Islands (Honiara)	10,637	18,707	30	1990
Vanuatu (Port Vila)	4,705	142,944	30	1989
Micronesia				
Federated States of Micronesia (Kolonia)	270	110,000	407	1991
Kiribati (Tarawa)	328	72,298	220	1990
Marshall Islands (Majuro)	70	49,000	699	1991
Nauru (Yaren)	8	9,350	1,142	1989
Western Samoa (Apia)	1,093	164,000	150	1990
Polynesia				
New Zealand (Wellington)	104,426	3,389,400	31	1990
Tonga (Nuku'alofa)	289	96,300	332	1990
Tuvalu (Fongafale)	9	9,100	984	1990
Possessions				
Australia	82	2,000	23	1990
Chile	63	2,000	31	1990
France	9,000	380,000	41	1990
Great Britain	14	–	–	
New Zealand	196	23,000	117	1990
United States	7,138	1,477,000	199	1990
OCEANIA	3,451,393	27,539,000	8.3	1990

Conversion factor: 1 mi^2 = 2.59 km^2

ECONOMIC SUMMARY

Just as Oceania is peripheral with respect to the more highly industrialized regions of the world, most of the Pacific islands are peripheral with respect to Australia or, in the case of Polynesia, New Zealand. These two countries, home to about 75% of Oceania's population, are highly urbanized and industrialized, and enjoy a Western standard of living. Their economies are much more solid and differentiated than those of the other Pacific islands, which are based on precarious agricultural and fishing activities, in some cases on mineral resources, and to an increasing extent on tourism.

While the smaller islands' mineral resources are essentially limited to nickel on New Caledonia, phosphates on Nauru, and gold and copper in Papua New Guinea, Australia is one of the leading producers of raw materials and fuels. In addition, Australia and New Zealand dominate trade with many of the Pacific islands, keeping nearby islands in a form of subjugation by managing their commercial, economic, technological, and financial relationships with stronger markets.

Within Oceania, a special relationship links New Zealand and Australia. Both nations are characterized not only by a shared colonial origin with a British imprint, but also by very similar political, cultural, and economic systems. Australia possesses enormous areas of farmland, huge mineral wealth, a solid self-sufficiency in energy, diversified industry, and five times the population of New Zealand. As a result, 20% of New Zealand's foreign trade takes place with Australia, although this accounts for only a small fraction of the latter country's trade volume. This commonality of interests is flourishing under the stimulus of a free trade treaty between the two nations signed in 1990. These special bonds between Australia and New Zealand are reflected by tourism, which grew slowly between 1945 and 1970, then increased rapidly in volume to the point of accounting for a substantial portion of each country's economy. And significantly, the largest flow of tourists is between the two nations.

Tourist traffic essentially mirrors the complex political and economic links present not only within Oceania, but also between Oceania and the more advanced countries of the world. Leaving aside interchanges of tourists between the two, Australia and New Zealand are destinations for visitors arriving from (in descending order) southeastern Asia, North America, and western Europe. The ranking is different in Melanesia, where the principal influx comes from Australia, then North America, then New Zealand; and is different again in Micronesia (Japan, North America, other Pacific islands) and Polynesia (North America, New Zealand, Australia). It is interesting to note that Micronesia, with its fascinating little coral islands, already attracts more tourists than Melanesia and Polynesia put together.

In today's environment, however, the small, peripheral economic areas are exposed more to the power of multi- or transnational corporations than to that of their own governments. As decisions are made in centers of power far away from Oceania, the minor economies of the southwestern Pacific become increasingly vulnerable to the vicissitudes of the global economy, especially in terms of market strategies and new investment decisions. In Australia and New Zealand, this vulnerability has recently been aggravated by the deregulation of financial markets, relaxed controls on foreign investment, and a reduction in efforts to protect manufactured products.

It is ironic in a way that after a few decades in which so many countries in Oceania gained political independence, the most significant trend of the 1990s seems to be a growing dependence of the small economies of Oceania on actions by corporate powers taking place far away from this immense but still isolated part of the world.

HISTORY AND CULTURE

As far as the most ancient traces of human presence are concerned, the region of Oceania presents a series of questions that researchers have not yet succeeded in answering completely. Although it is universally agreed that human settlement in these islands resulted from successive migratory waves originating from southeastern Asia in the Pleistocene period, it is more difficult to determine how these populations became distributed, over the millennia between then and the present, over such a vast geographic area, reaching even the most far-flung islands, mixing and interbreeding to produce groups as clearly

differentiated as the Australian Aborigines, the Micronesians with their Asiatic features, and the light-skinned Polynesians (descendants of more recent arrivals who probably came from maritime areas around China). Henri-V. Vallois explains:

We know that the subdivisions of Oceania are not so much geographic as anthropological. Each region, except Micronesia, is the almost exclusive habitat of a particular human group: Polynesians, Malays, Melanesians, and Australians each represent a physical type, in other words an independent race. In these circumstances, there would seem to be little point in combining all these island regions, and it would be preferable to make each of them an anthropological region. Recent studies have demonstrated, however, that matters were more complex than they seemed. On many Oceanic islands there also exist, alongside the predominant races, more or less clearly defined primitive elements. Moreover, this entire part of the world was populated in a series of migrations, moving from northwest to southeast, the successive waves of which extended simultaneously to a large number of island groups. All of this gives Oceania as a whole a certain unity....

Assisted by winds and ocean currents, human populations spread over the archipelagoes comprising the "water continent," and the process by which they subsequently adapted to its various climatic and environmental conditions led to the creation of a wide variety of material cultures. The Australian Aborigines remained at a very primitive level, living a nomadic life based on hunting and gathering, using rudimentary tools such as the spear, club, and boomerang. Further advances occurred on the Polynesian islands, where agriculture, hunting, and fishing were practiced; these activities were passed on from there to New Zealand, and were further developed by the Maori.

Social structures varied from simple clan groupings in Melanesia, where tribes interacted with one another on the basis of kinship systems and totemic bonds, to the relative complexity of the Maori, with their aristocratic society in which specific roles were performed by the nobility, priests, and warriors. A similar heterogeneity characterizes artistic production, which varies from Australian rock paintings, with their obscure ritual and mythical symbolism, to Melanesian masks full of expression, the abstract elegance of Polynesian linear decoration, and the monolithic colossi of Easter Island. On close inspection, a shared religious sensibility is evident beneath these very different forms of artistic expression: a shared faith in the mysterious force which creates and animates the world, expressed as the vital force of one's ancestors, to be preserved and passed on specifically by means of the symbolic representations of religiously inspired art.

The Polynesians were careful observers of nature, and possessed a wealth of meteorological and oceanographic knowledge that was vital for sailing. Folco Quilici describes their achievements.

In this arena it was not just an elite, but many Tahitians who demonstrated uncommon knowledge indicating a true "sailing sense" with regard not only to the sea (the strength and direction of waves, swells, and currents) ... but also to the atmosphere (seasonal differences in winds, clouds, weather predictions, etc.)...

In Tahitian cosmogony, the winds were powerful representatives of the gods, and warned the people of certain dangers by murmuring mysterious things.

For the Polynesian navigators who made long journeys under sail (paddles were used only during periods of calm and for arrival and departure maneuvers), a knowledge of wind direction was essential. That direction was indicated in relation to the east, and the Tahitian compass card lists the names of the winds according to their provenience, and sometimes their strength.

According to various authors, the horizon was divided into 12, 16, and sometimes even 32 parts, which allowed the pilot to maintain his course. The winds were also subdivided and classified. The most famous were the northeast wind, Toereau; the east wind, Maoae; the southeast wind, Tou; and the southwest wind, Uru, which became Urupa when it was strong. Lastly, the most feared wind was that from the south, Maramii.

There were also navigational instruments. It is certain that the Polynesians did not have many, but tradition has passed on to us the name of only one, along with its ability to "tell" the Polynesians their position at sea on the basis of the stars; this was the famous, but highly dubious, "sacred gourd." Here is what Bisschop says about it:

"It was in fact a gourd whose end had been cut and emptied: under the circular rim thus formed, a series of holes had been made at a certain accurately calculated distance. The gourd was filled with water, to a level reaching this series of holes.... How was it used? Simple: they sailed north. After they crossed the equator, the Pole Star appeared, and rose farther above the horizon every day. They knew that when it reached a certain height, known to the high priests, they had come to precisely the latitude of Hawaii; if they then sailed with the wind astern, they could not miss the islands....

At that point the 'sacred gourd' indicated a 'magic angle': if it was held perfectly horizontal (and one could tell when it was horizontal when the water level touched the series of holes arranged in a circle), it was used to sight through one of those many holes at the Pole Star, which would just touch the rim when the boat had reached the latitude of Hawaii."

It is surprising to find that a world as rich and fascinating as that of the Oceanic islands did not immediately seize the attention of European navigators, who—once the Pacific had been discovered by Vasco Nuñez de Balboa in 1513—ventured onto the "southern sea" along the long-sought route to the Indies.

Although the West had inherited from the Middle Ages the Ptolemaic idea of a fabulous and extraordinarily wealthy "Terra Australis incognita" located at the Antipodes, the routes to the Indies for many years skirted Oceania; Magellan himself made his crossing of the Pacific almost without realizing the existence of dry land. In addition, the islands that were gradually discovered (the Marianas by Magellan in 1521; the Solomons and Marquesas by Alvaro de Mendaña in 1568–1595; the New Hebrides by Pedro de Queirós in 1606) did not seem to offer the abundance of gold and spices that the Europeans expected. The voyages made by Abel Tasman and the other Dutchmen of the East India Company in the first half of the 17th century revealed the outlines of the Australian continent and of major islands such as New Zealand and Tasmania, but were not followed up for similar reasons.

More than a century passed before voyages of exploration to the South Seas were resumed; this time, the mirage of spices and

gold having faded, they were made in a modern scientific spirit. Credit for this "rediscovery" goes to the Englishman James Cook, who sailed from Plymouth on August 25, 1768, in command of the *Endeavour*, charged by the Royal Society with reaching the other hemisphere to observe the conjunction of Venus with the sun. His purpose was not only astronomical but also geographic and cartographic, and the three voyages he made within a single decade were sufficient to refute once and for all the "Terra Australis" hypothesis, and define with good accuracy the face of Oceania. Ranging from Cape Horn to the Antarctic Circle, from the Cape of Good Hope to the Bering Strait, Cook explored the Marquesas islands, the New Hebrides, New Caledonia, the east coast of Australia, and New Zealand.

Beyond their scientific value, his voyages were also very important in cultural terms, as a demonstration of the attention and respect that a European could devote to the native world, its different way of life, and its different relationship to Nature. In fact, the sensitivity displayed by Cook to the human aspect of the universe he discovered had no great consequences. As a practical matter, his expeditions, which combined scientific interest with explicit political goals, opened the way for the British conquest of the Pacific.

This conquest was a late one compared to those achieved in other parts of the world, and was initially limited to small areas and impelled by particular motives, such as the establishment of penal colonies. The process accelerated, however, in the later 19th century, intermeshing with the expansionist plans of France, the Netherlands, Germany, the United States, and Japan, and leading to a complete political partition of the Oceanic islands. Thus began the period of "systematic colonization" postulated by Edward Gibbon Wakefield, a period of intensive immigration involving massive influxes from Europe and Asia. For the natives, this collision with the white world was inexorably disastrous: many of the peoples of Oceania who had retained ways of life dating back to the late Neolithic were literally exterminated (the last representative of the Tasmanians, an old woman, died in 1876) not only by massacres, violence, and expropriation of their land by colonists, but also by epidemic diseases brought in by Europeans, and by the spread of alcohol and firearms among rival tribes. The more advanced Polynesian peoples, even though they experienced more moderate forms of colonization, saw the breakdown of centuries-old traditions, social systems, and cultures based on a perfect (albeit fragile) balance between humans and the natural world.

Nevertheless, the spiritual and material heritage that has always characterized the lives of the peoples of Oceania is rich and varied in the context of their natural environment. From a judicial and social point of view, the purposes and intentions of government among these populations are the same as in a modern society: to regulate the internal life and external relations of the community, keep the group united, safeguard food supplies, and maintain peace and established order within and beyond the community's borders. The borders of the territory over which the group asserts property rights are well known, not only to members of the group, but also to those of neighboring groups. Among the Tasmanians, a border violation was tantamount to a declaration of war. Sometimes an increase in population and the consequent need to expand its own economic base forced one local group to invade another's territory. Sir James Frazer reports one such case involving a group of Australian Aborigines:

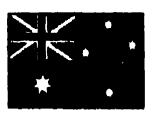
> *They sent their public messenger to one of the adjoining subtribes, asking for a part of the latter's land. This was refused, as being against tribal law, and also because the* taurai *in question was not big enough to admit to the proposal. The former subtribe then sent to say they would come and take what they wanted. The latter answered that in that case they would appeal for justice and help to the neighboring subtribes. Thereupon both sides prepared for war, met, and, as usual, much talking and angry speech-making followed. It was at last agreed that next day an equal number from each side should fight it out, but when the time came the dispute was settled by single combat. This is the common cause and issue of a tribal quarrel.*

With the end of World War I, the German presence was eliminated and Australia and New Zealand joined the ranks of the colonial powers. But the forces that came to dominate all the others, and in the end clashed dramatically during World War II to establish supremacy in the Pacific, were Japan and the United States. Between 1941 and 1944, these vast stretches of ocean sprinkled with archipelagoes and coral atolls witnessed a series of intense air and sea battles which culminated in an American victory. Of course the conflict heightened the contrasts between the native and white worlds, leading to crises in the western region, especially New Guinea, where the untouched forests of the remaining Papua people were carved up for military purposes with a network of landing strips, airports, roads, and bridges.

The postwar period was a difficult one, during which Oceania was divided into spheres of influence dominated by the United States, Australia, and New Zealand, with negative repercussions both in environmental terms (enormous damage was caused by nuclear explosions, urban pollution, and the tourist industry) and on a human level: although the native populations have grown in recent decades, that growth has been accompanied by disturbing changes such as urbanization, ghettoization, and loss of cultural identity.

The future of the Pacific islands therefore looks troubled and problematic in many respects, and it is still linked to development decisions made by the Western world: it is imperative that the West set aside its hitherto facile fascination with the "exotic," escape from the literary and artistic myths it has been bequeathed by Melville, Gauguin, Stevenson, and Maugham, and see Oceania as it really is today, with all its needs and with a history that must be preserved as part of a heritage belonging to humanity as a whole.

AUSTRALIA



Geopolitical summary

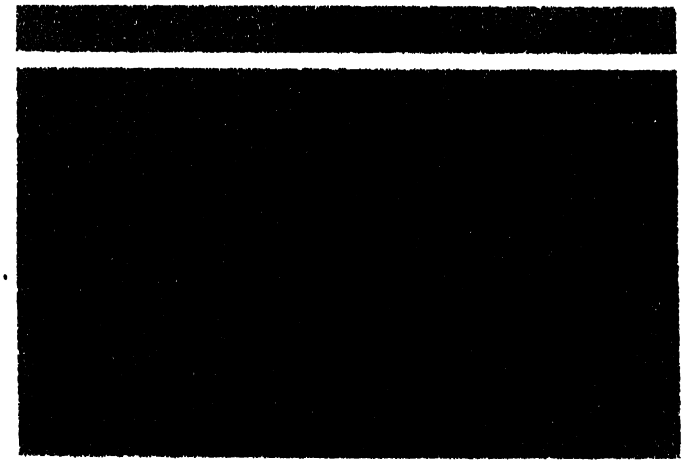
Official name	Commonwealth of Australia
Area	2,965,368 mi² [7,682,300 km²]
Population	17,486,300 (1992 estimate)
Form of government	An independent nation, with a federal structure, within the Commonwealth. The head of state is the sovereign of the United Kingdom, represented by the governor. Legislative power is exercised by the Senate and the House of Representatives, elected respectively every six and every three years by universal suffrage. Executive power lies with the Federal Executive Council, presided over by the prime minister.
Administrative structure	6 states and 2 territories, subdivided into communes, cities, counties, etc.
Capital	Canberra (pop. 278,900, 1991 estimate)
International relations	Member of UN, the Commonwealth, OECD, SPC, Colombo Plan, and ANZUS
Official language	English
Religion	Christian 73%, of which Catholics constitute 26% and Anglicans 24%; 25% of the population professes no religion.
Currency	Australian dollar

Natural environment. Located in the Southern Hemisphere between the Indian Ocean to the west and the Pacific to the east, and traversed by the Tropic of Capricorn, Australia extends between 10° 41' S (Cape York, on the Torres Strait) and 43° 39' S (Southeast Cape, in Tasmania) and from 113° 09' E (Steep Point) to 153° 39' E (Cape Byron, south of Brisbane).

Geological structure and relief. Generally speaking, Australia's landforms and landscape have little variety, in that the mountain formations have long been exposed to erosion and decomposition from atmospheric agents. Moreover, much of Australia was not affected by the foldings of the Tertiary period; in fact, with the exception of the eastern slopes of the Great Divide and the Australian Alps, the reliefs date back to the Paleozoic era.

Despite the continent's uniformity, the coasts are rather well articulated; the northern coast, bathed by the Indian Ocean, the Timor Sea, and the Arafura Sea, is rocky, with numerous bays and fjords. The broad Joseph Bonaparte Gulf opens onto the Timor Sea, the large Gulf of Carpentaria onto the Arafura Sea. The western coast, bordered by the Indian Ocean, is high from Cape Leeuwin to Perth, becoming lower, sandy, and rather monotonous further north, with the exception of the projections that enclose Shark Bay. The southern coast also borders the Indian Ocean; the Great Australian Bight is completely lacking in harbors, since access to the sea is blocked by steep cliffs; toward the east two deep, narrow bays, the Gulf of St. Vincent (across from Kangaroo Island) and Spencer Gulf, open up. The eastern coast, bordered by the Coral Sea and the Pacific Ocean, has inlets that have allowed the development of port facilities. The northeastern coastline is fringed by the 1500-mi [2400-km] long Great Barrier Reef, which acts as an enormous natural dam against which the ocean waves break.

The coral islands in this area result from the formation of colonies composed of billions of minuscule polyps, called madrepores, on submerged volcanic cones. These small animals have an external skeleton of a hard, calcareous material, which remains unaltered after the animal's death. Colonies are superimposed, one upon another, growing an inch or so each year; when the madreporic mass emerges from the sea it captures particles of earth and sand, in addition to seeds and granules of pollen borne by the wind, over time building up an island of material. This process determines the formation of islands (generally circular "atolls") and coralline rocks along the coast, sometimes joined in more extended formations, or "reefs." In order to survive and thrive, the madrepores require limpid, rather rough, tepid waters (with temperatures never lower than 68°F [20°C]); it is easy to imagine the splendid submerged world of the reefs composed of coral walls and multicolored



seaweed and populated by a particularly rich and varied fish life. Mary Ann Harrell has written about this immense, marvelous natural landscape:

Nothing conveys the grandeur of the reef like an aerial view. Early one Sunday I joined a couple of parkies—marine park staff—on an air patrol from Cairns. We droned up into golden light, eastward over green isles and sandy cays and coral labyrinths that span the horizon. Deep channels ran a vibrant ultramarine; shallows ranged from pale blue to brown-gold; other reaches glowed in the subtle greens of weathered copper. Upsun the breeze raised tiny gold-foil crinkles over the slow advance of ocean swell. We watched in vain for dugong, the endangered sea mammal still common here. Near a sand islet called Beaver Cay, we looked for manta rays—and found one: a huge dark fish with pectoral fins like batwings ten feet long, flapping its uncanny slow-motion way through a lazy current.

A spot called Low Isles, mangrove habitat near Port Douglas, gives low-tide views of fauna from the intertidal zone—"a very, very harsh environment," explained the biologist guide on a beach walk. In the shallows, we saw soft corals that resembled spaghetti, or dish-mops of thick yellow yarn. A few dead patches of hard coral had been smothered by mud carried down the Daintree River. Tough as reef creatures are, they're ill-prepared for pollution.

Gazing at the coast north of Port Douglas, from a speeding catamaran, I was thrilled to see nothing man-made. Forested highlands looked as pristine as Captain Cook saw them when he edged warily northward among the reefs in 1770. Squinting into sun dazzle, I understood how these uncharted waters had menaced his small Endeavour *and why he named a headland Cape Tribulation. Perhaps, I thought, I got here just in time. One spire, one high rise, one anything would have broken that illusion of time transcended.*

Tides measure the hours on the remote reefs. The run to Agincourt R ef crosses shallows where the Aborigines hunted 18,000 years ago, when sea levels were lower and the land was dry. This reef lies near the edge of the continental shelf. Even on a calm day, combers striking a coral rampart hurled their white spray high. The catamaran moored at an underwater observatory. A semisubmersible ferried a German party around the site. A dive maste took the scuba mob to a trail of their own, and a small school of blue-finned snorkelers joined larger schools of fish in silky winter water, just cool enough. As the tour biologist said, "It's an animal garden, an animal landscape, an animal community with plants tucked inside."

Even if the continent geologically consists of a single large block, from a morphological viewpoint it is possible to distinguish three large regions. The first region, the Great Western Plateau, or Western Australian Shield, a vast, ancient tableland with an average elevation of about 1000 ft [300 m], is the result of the breaking down of ancient mountain chains, the only remaining traces of which are some modest peaks: the Macdonnell and Kimberley Ranges. To the west of the former lie the Great Sandy Desert, the Gibson Desert, and the Great Victoria Desert, desolate lands covered with sand and scattered with "lakes," or more accurately, broad salt basins, almost always with very meager water levels. On the barren plains at the center of the continent rises Ayers Rock, a striking red sandstone formation, similar to a mountain with a chopped-off summit; it is the end result of an extremely long erosion process that has leveled the region (which is now extremely arid), leaving some "rocky islands" such as this.

The second region, the East–Central Lowlands, extends from the Gulf of Carpentaria in the north to Spencer Gulf in the south, with an average elevation below 500 ft [150 m]. This depression is divided in two parts by the Grey Range, with the basin of the Murray and Darling rivers stretching to the southeast, and the Great Artesian Basin to the northwest. The latter is an immense, arid, low region that derives its name from the abundance and wealth of subsurface aquiferous layers. Drilling there causes water to spurt out spontaneously (artesian wells) or rise to easily reachable levels (subartesian wells). These highly saline waters are not usable for human needs, but are tolerated by animals.

Finally, the Eastern Uplands consist of the Great Dividing Range, or Great Divide, formed by a group of plateaus, the remains of ancient eroded relief formations. The Great Divide stretches southward into the Australian Alps; here, Mt. Kosciusko rises, over 7300 ft [2229 m] high, the tallest peak in Australia.

Tasmania, separated from the continent by the Bass Strait, is a mountainous island. It is dominated by a central, volcanic plateau, strongly eroded and scattered with lakes, some of which lie at elevations above 5000 ft [1500 m].

Hydrography. Australia's only important river basin is the Murray-Darling (351,260 mi^2 [910,000 km^2]), located west of the Great Divide. The Murray and Darling rivers (which, after merging, flow into the Indian Ocean near Adelaide) are torrential in nature, and subject to prolonged dry and sudden full periods.

The central depression region, which usually lacks surface water, is dotted with large closed basins, generally occupied by temporary shallow lakes, and for most of the year made up of vast muddy surfaces covered with salty incrustations. The largest is Lake Eyre, the area of which averages around 3500 mi^2 [9000 km^2]. In reality it is impossible to speak of absolute area in connection with these lakes; during the violent rains (which last for very brief periods) the waters overflow, covering large surrounding areas, only to then vanish quite suddenly, either through evaporation or absorption into the soil.

All the Australian regions with desert climates have ancient river beds; these creeks, which bear witness to the very different environmental conditions that prevailed in past epochs, fill up with water whenever there are sudden, violent cloudbursts.

Climate. Australia's location in the Southern Hemisphere, is antipodal to that of Europe, and consequently the seasons are precisely reversed with respect to the Northern Hemisphere. The Australian summer is at its height in January, while the dead of winter (which is never excessively severe) occurs in July. More precisely, Australia lies at latitudes 10° to 40°S and is cut almost in half by the Tropic of Capricorn. Its climate is characterized by a scarcity of rain, with more elevated temperatures toward the country's interior. Only along the eastern coasts and in the area around Perth does the annual rainfall reach 39–78 in. [1000-2000 mm]. The "productive" area is distinguished by a relatively uniform climate, with average annual temperatures that range from 81°F [27°C] in the north to 55°F [13°C] in the south.

Overall there are five large climatic regions: the southwest, north, southeast, savanna and prairie area, and the large desert zones.

The southwest constitutes a sort of "demographic island," quite different from the rest of "productive Australia"; it is a broad region that includes a coastal strip and the immediate

inland area between Shark Bay and the city of Albany. Here the temperate Mediterranean-like climate has favored the development of intensive agriculture and cattle raising.

The vast northern region that stretches from the Dampier Land peninsula in the Kimberleys region to the Cape York peninsula has a subequatorial climate along the coast and a tropical climate in the interior, with most of the rainfall occurring in the summer months. There is a predominance of evergreen eucalyptus, sometimes together with beechwood, and the marine life is particularly rich, with oysters, sea cows, tortoises, crocodiles, and great white sharks. The eastern portion of Queensland can also be included in this area; its climate is for the most part subequatorial to tropical (with abundant precipitation, favorable to the development of a stratified rainforest). Further south, in the area that extends down to Brisbane, subtropical forest predominates, finally giving way to evergreen eucalyptus. This region is inhabited by numerous marsupials, reptiles, and birds; the waters between the coast and the Great Barrier Reef are populated by a wealth of marine life.

The coastal region between Brisbane and the Eyre peninsula enjoys a temperate oceanic climate. Forests of eucalyptus and beechwood blanket the hills and mountains overlooking this stretch of the coast, where a large majority of the Australian population has settled. The climate of Tasmania is also distinctly oceanic; mild fluctuations in temperature and abundant rainfall (averaging over 59 in. [1500 mm] and well distributed throughout the year) are advantageous to the development of agriculture.

The passage from the temperate to the desert zones is marked by the tree lined savanna and prairie (which in some places becomes a true steppe region). The savanna dominates, with its eucalyptus, baobab, and acacia trees, in the hot climates with arid winters north of the Tropic of Capricorn; this is the realm of the kangaroo and the emu. The prairies are characteristic of the hot, dry regions situated particularly along the interior slopes of the eastern mountain ranges. The construction of modern irrigation facilities has enabled the cultivation of wheat and the raising of cattle in these regions.

Deserts occupy the central and western portions of Australia, a broad area characterized by scant rainfall, high daytime temperatures, and strong diurnal and annual temperature fluctuations. The so-called "outback" or "never-never" consists of dense, red sand dunes, or rough stones or clayey surfaces covered by layers of salt and gypsum. One of the few plant formations that grow in this region is *Spinifex*, low, broad thorny bushes; the deserts are populated by dingos and numerous species of reptiles, insects, and kangaroos.

Flora and fauna. Due to Australia's temperature and precipitation conditions most vegetation grows in the coastal areas, where, depending on the latitude, there is a predominance of tropical forests, eucalyptus, or deciduous trees. Proceeding toward the interior, the landscape soon changes to tree-lined savanna with gigantic baobabs; this in turn becomes grassy savanna and then desert steppe with low, thorny bushes. The center of the continent is occupied by true desert regions, with reddish sand dunes and expanses of solid rocks smoothed by erosion.

There are four fundamental types of vegetation areas in Australia: the bush, a region of scattered eucalyptus growth, with trees 100–130 ft [30–40 m] high on average, which extends into the eastern part of the country; the mallee, made up of extremely tangled eucalyptus tracts, 13–16 ft [4–5 m] high, which covers vast areas of southern Australia; the mulga, similar to the mallee but made up of acacia trees; and the scrub, an impenetrable and continuous growth of dwarf eucalyptus, thorny acacias and other shrubs, which surrounds the vast central desert zone and is largely inaccessible to humans and animals.

Overall, Australia is relatively poor in plant species. The most common is eucalyptus, of which there are over 400 different species, and which can grow as high as 325 ft [100 m]. Eucalyptus is used in many industries; tannin is extracted from the bark, while the leaves produce oils used for the preparation of medicines, perfumes, cosmetics, and other products.

For a variety of reasons (the foremost of which is the isolation resulting from its long-ago separation from the supercontinent Pangaea), Australia is inhabited by extremely ancient animal species, not found elsewhere, which have been able to survive in the absence of competitive species. The deserts are inhabited by numerous reptiles, including the frightening moloch, or thorn devil, similar to a miniature dinosaur and covered with a thick pointed shell. The savannas are the domain of the emu, a large bird quite similar to the African ostrich. Platypuses, animals with duck-like beaks and webbed feet, live along the rivers; although they are mammals, they possess many primitive characteristics that link them to birds and amphibians. They lay eggs and can live equally well on land or in water, and they are monotremes, that is, they have a single channel for excretion, another trait that demonstrates their primitive stage of development. Australia is well known for its kangaroos, and the continent boasts over 50 species, ranging from those as small as rats to the great red kangaroos, which can grow to a height of over 6 ft [2 m] and can weigh more than 220 lb [100 kg]. The kangaroo is a more evolved mammal than the platypus, but it too has primitive characteristics. After birth, the young must pass a certain period of time (approximately seven months for the giant kangaroos) in a special maternal "marsupial pouch" where they are fed and protected. Kangaroos are both swift-moving and powerful jumpers (they can reach speeds of up to 38 mi [62 km] per hour and jump as high as 7–10 ft [2–3 m]). Another well-known Australian marsupial is the koala, which lives in the southern and eastern portions of the country. The koala's diet consists solely of eucalyptus leaves; they can tolerate no other food and do not even drink water. There are numerous birds, bats, and crocodiles. The only higher carnivore is the dingo, a wild dog that lives in the desert and semi-desert steppe regions.

Population. The first inhabitants of Australia were probably ancient Australo-Melanesian peoples who arrived from the archipelagoes of southeast Asia. At least 40,000 years ago these populations reached Australia, steering rudimentary boats past the Sunda islands, or going by way of New Guinea and crossing on foot over a land bridge now submerged by the Torres Strait. The Australoid geographic race, long-limbed and dolichocephalic (with oval skulls, elongated from front to back), settled throughout the continent in 500–600 tribes, each composed of several "bands," or groups of families. These people spoke over 200 different but related tongues, and led a semi-nomadic life within territories circumscribed by natural elements such as streams, rocks, and trees, dwelling in rudimentary huts or holes

dug in the sand; they were engaged in hunting (predominantly kangaroos) and gathering wild fruit, tubers, and roots. Ritual cannibalism was also practiced.

Strongly tied to the social nucleus of the clan, the Aborigines attributed a great deal of importance to traditions and to mythical and religious beliefs, in which totemism, initiation rites, dances, and a variety of figurative artistic expressions (paintings, rock carvings, statues and heads of wood, stone, and clay) associated with sacred rituals all played a major role. Their numerous secret-sacred ceremonies were often seen as the means by which they manifested a desire to ensure the continuance of their world according to the laws set forth by mythical common ancestors, or "Dreaming beings," who were thought to control all aspects of life.

In the 18th century the European colonizers clashed with these populations, who are estimated to have numbered somewhere between 300,000 and 1 million. For the Aborigines this was the beginning of a long, merciless annihilation, caused by illnesses disseminated by the colonists and previously unknown on the continent, by the progressive erosion of their culture due to the abandonment of original traditions, and by the spread of alcoholism, not to mention by the outright slaughter committed by white settlers seeking better lands.

Even during the 20th century, despite some initiatives taken following World War II to incorporate the Aborigines into the social life of the Australian state (particularly the 1948 "law on nationalities," which officially declared them "British citizens"), the Aborigines have never been integrated into the community and world of the whites. On the one hand, the more or less open hostility of the Europeans, and on the other hand the passivity or in any case suspicion of the Aborigines themselves, has led to a situation that remains difficult and fraught with conflict. Many of the approximately 230,000 Aborigines (or "Kooris," as they are sometimes called) who currently live in Australia reside on 300 reserves located predominantly in the Northern Territory, Western Australia, and Queensland. In 1980, however, the Aboriginal Development Act was enacted, which has interesting prospects: it sanctions self-rule of the reserves, which, through funds earmarked for self-administration, can acquire territories of particular historical and economic significance, in addition to allowing loans to families interested in buying houses or land or setting up businesses. This is part of a plan to revive a population and a culture seeking to regain its identity, above all searching for autonomous solutions that correspond to their own needs and interests.

Today the great majority of Australians are whites of European background. Initially these settlers came mostly from Great Britain; in 1840 Australia had about 200,000 white inhabitants (150,000 convicts and 50,000 colonists), almost all of them British. Within the span of a few decades the population grew rapidly, thanks to an increase in immigration (especially from Mediterranean and central Europe), which was due to numerous factors such as the discovery of gold, the development of sheep-farming and agriculture, and the growth of trade and mercantile shipping.

This situation is described quite well by Craig McGregor:

Another fundamental demographic change has been the altering pattern of immigration. Up to the end of World War II, almost all immigrants came from the British Isles, reinforcing the Britishness of Australia's official institutions with their habits of thought, their social customs, and their preconceptions. New arrivals could feel at home in a country where they could drive on the left and pay for things in pounds, shillings and pence (the Australian dollar dates only from 1966, when the currency was decimalized). The nation's institutions were equally close to those of the mother country. Not only were the laws strictly after the British pattern, but judges wore the same archaic paraphernalia of robes and wigs....

But it was in the details of daily life that the British flavour of pre-war Australia became most apparent. A culture that had evolved in a cold, wet, northern climate was thrown into high relief when imported lock, stock and barrel into the sunny light of the tropical south....

Attitudes began to change in the course of the war. The shock of the Japanese threat, including the bombing of Darwin, led to a rethinking of attitudes that was to affect profoundly the structure of Australian society and ultimately to reduce the British influence. Politicians of all colours came to the conclusion that the continent was dangerously underpopulated, and had insufficient forces to defend itself. A policy of financially assisting immigrants with the costs of passage was adopted, and it was extended to settlers from continental Europe as well as from Britain. The result was a massive influx of almost 3 million newcomers, arriving at an average of 100,000 a year, until restrictions were again imposed in late 1974. By that time the proportion of Australians born overseas had doubled, from one in 10 to one in five. Fewer than one third of the new arrivals came from Britain; Italy provided about 16 per cent, Greece about 10 per cent, with Germany and the Netherlands also contributing substantial numbers.

The most recent trend has been a vast increase in the number of Asian immigrants. Since the 1950s, the infamous 'White Australia' policy, used in effect to disbar Asian entry, has been gradually eroded. By the early 1980s, roughly a third of all immigrants were Asian, and the "Asianisation" of the country was an issue beginning to arouse political passions.

In 1881, the year of the first general census, Australia had a population of 2,250,000; in 1901 there were 3,773,800 inhabitants in the "Australian Commonwealth"; thirty years later the number had almost doubled, and in 1951 the total population was approximately 8.5 million. During the 1980s, growth settled down to an annual rate of 1.4%, of which 0.9% was due to natural growth and the remaining 0.5% to immigration. This latter phenomenon, after the two great migratory waves of the late 1940s and the 1960s, is now experiencing a decline due both to the economic crisis and to measures for the control of the ethnic and professional makeup of the immigrant population. These measures, following the ups and downs of the past decades, are undergoing a new restrictive phase. Of the 17,086,197 inhabitants in 1990, the predominant ethnic stock is still British, followed by Italian, Yugoslav, and Greek. Recently, however, there has been a decrease in the number of new European immigrants (approximately 20,000 people in 1985, with a clear predominance of English and Irish), and an increase in those coming from Asia (35,000 people that same year, a third of whom were Vietnamese).

In such a composite society there are numerous languages and religions, as well as a great variety of customs and traditions. This constitutes a rich and precious cultural heritage, which peo-

ple are seeking to safeguard and value as they define a "pluralistic Australia." The official language is English; there is complete religious freedom, with Christianity being the predominant faith.

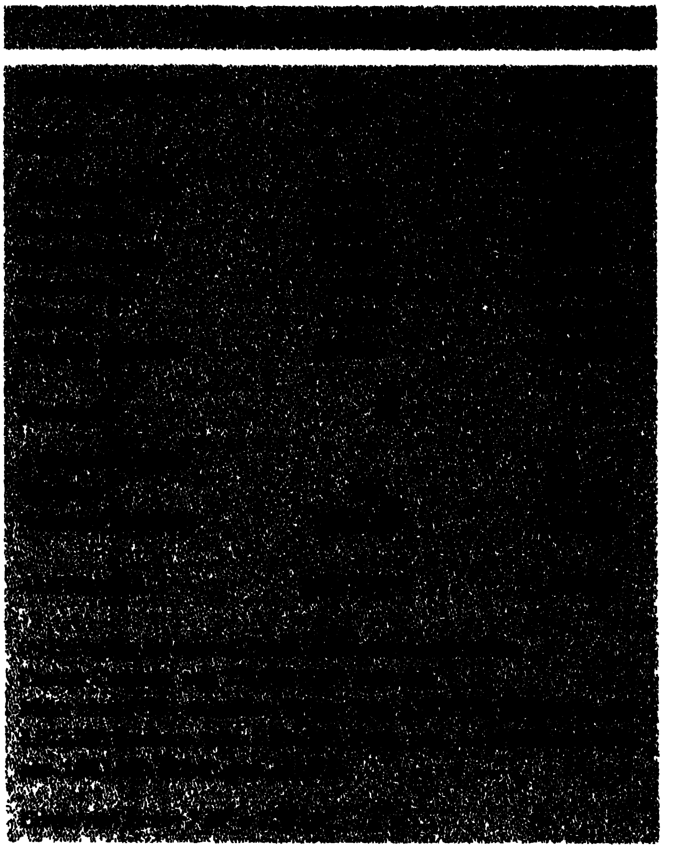
Some ethnic groups in particular, while integrated in many ways into the social and economic life of the country, have maintained their own customs over time, or have preserved a certain solidarity, defending ties and habits that come from a common origin. This has been the case—to cite one example illustrative of others—of the Italians who began emigrating to Australia at the end of the 19th century, initially drawn by the "gold rush" and then by the hope of finding satisfying employment. As early as the 1920s there was a rather cohesive Italian colony, made up for the most part of men, particularly farmers, floor-layers, laborers, and fishermen from all parts of Italy. These people's sole wealth often consisted of their labor, and they adapted to a life in the harsh conditions of the countryside (for example, working in the immense sugar-cane plantations in Queensland), coping with serious problems caused by language differences, social relationships, climate, and environmental conditions very different from those they had left behind. Some, however, managed to save enough to purchase small farms and to bring their families to Australia.

With the development of the industrial sector, some of these immigrants joined the Australian working class, enjoying to some degree the good social and health conditions that the strong workers' organizations ensured. The great emigration of Italians and other ethnic groups to Australia (and in particular to Victoria and New South Wales) took place after World War II. This second migratory phase, which was particularly intense in the 1950s, saw an increase in the percentage of people coming from southern Europe. Although they usually started out doing humble work and sometimes met with hostility on the part of Anglo-Saxon settlers (mainly as a result of prejudice, misunderstanding, and cultural differences), the immigrants were successful over time in attaining positions of importance in every field of Australian life. Today there are some 100,000 people of Italian descent, for example, in Australia; it is difficult to calculate their precise number with the passing generations. Even today, these immigrants feel a strong attachment to their homeland or the land of their parents or grandparents, and they constitute a particularly cohesive and organized social group, boasting numerous ethnic associations of various types, including newspapers and even their own television programs.

Currently Australia is underpopulated, with an average density of only 5.4 inhabitants per mi^2 [2.1 per km^2]. Although vast desert regions are practically uninhabited, this density remains modest even in the more populous areas; in Victoria and New South Wales, which are the two most heavily settled states, the average density is, respectively, 49.2 and 18.6 inhabitants per mi^2 [19 and 7.2 per km^2].

The population is particularly dense in certain coastal areas where the principal urban centers lie, while less than 15% of Australians live in rural areas. These are often immense expanses of grazing land, where cattle and sheep raising is widely practiced and where ranchers and farmers, who generally dwell on large isolated farms, live a hard, solitary existence.

Despite scientific and technological developments that have somewhat eased the rigorous effects of the country's physical environment (uneven distribution of rainfall and of surface and



underground water; difficulties in the construction and maintenance of transportation routes, etc.), the forces of nature still exert considerable influence on the population density, with the largest urban concentrations located in certain coastal areas at the edge of the more hospitable and arable regions. The resulting impression of these centers is more American than European, with broad streets often intersecting at right angles, and with a clear distinction between residential and commercial areas. Urban areas, with impressive skyscrapers, exist in clear contrast to vast neighborhoods of single-family dwellings (apartment buildings are less common). The residential suburbs of the main metropolises have spread rapidly in recent decades, not always following coherent urban planning. This has led to an extraordinary expansion of urban areas, with notable rush-hour traffic problems. The five most populous cities (Sydney, Melbourne, Brisbane, Perth, and Adelaide) alone account for approximately 60% of the country's population.

Sydney, founded in 1788, is the oldest European settlement in Australia. The original settlements of Parramatta and Sydney Cove expanded over time to form a large urban area now encompassing about thirty municipalities over an area of more than 205 mi^2 [530 km^2]. Its population has grown precipitously in the last sixty years, jumping from 220,000 inhabitants in 1925 to over 3.6 million in 1988. The capital of New South Wales, Sydney enjoys an excellent energy system, based on the use of coal and on water sources that supply numerous iron and steel, metallurgical, machine, chemical, textile, and food-processing industries located at the city's periphery and in the port area between Port Jackson and Botany Bay. The particularly extensive and modernly equipped harbor is the most important on the

continent and a very busy port of call on the principal trade routes of the Indian and Pacific Oceans. A dynamic service sector (with great development of activities tied to transportation, trade, finance, telecommunications, and services to the business, scientific, and cultural worlds) contributes to making this metropolis the heart of the vast coastal conurbation that revolves around it, as well as a polarizing hub of extreme importance in the country's urban network and economic system.

Melbourne is Australia's second-largest city, with over 3 million inhabitants. The capital of Victoria since 1851 and of the entire nation from 1901 to 1927, it is the site of large machine industries (particularly automobile-related), and chemical and petrochemical industries, part of which spill over into the nearby industrial city of Geelong, which, located on an arm of Port Phillip Bay, constitutes, along with Melbourne, another important port system. Melbourne's continuous and often uncontrolled expansion has recently led to the application of a large regulatory plan for an area of over 1930 mi^2 [5000 km^2], with the goal of planning metropolitan expansion toward certain principal axes of growth. Numerous Victorian-style public buildings (such as the Parliament and City Hall buildings), striking churches (such as the Anglican cathedral of St. Paul's and the Roman Catholic cathedral of St. Patrick's), three universities and many museums and art centers make Melbourne one of the liveliest cities in Australia from a cultural viewpoint, just as development of the banking and commercial sectors has made it one of the continent's major service centers.

Canberra, the present-day capital, deserves particular mention. Located in the Capital Territory, on the southwestern side of the Great Divide about 150 mi [250 km] southwest of Sydney and 400 mi [650 km] northeast of Melbourne, the city sits on a vast plateau about 75 mi [120 km] from the Pacific coast and is surrounded by mountains and prairies. This site was chosen "on paper" in the early 20th century, to balance the opposing and rival forces of the two principal metropolises, and to emphasize the capital as a symbol of national unity. Established as a legal entity by a 1911 decree and made the national capital in 1927, Canberra was built according to the design of American architect Walter Burley Griffin, who applied master plan theories for a zoned garden city. His plan has a geometric formalism with the main streets radiating from various cores and broad open spaces of greenery and an artificial lake separating the administrative, residential, commercial, and industrial sections. Present-day Canberra, which has over 300,000 inhabitants, is predominantly a political, administrative, and cultural center, supported by the skilled service sector that has developed there.

With a few exceptions (such as the industrial centers of New Castle and Wollongong in New South Wales and the tourist center of the Queensland Gold Coast), the other major Australian cities are the state capitals: Brisbane in Queensland, Perth in Western Australia, Adelaide in South Australia, and Hobart in Tasmania. Darwin, which has almost 70,000 inhabitants, is the main urban center in the Northern Territory.

Economic summary. Australia has an advanced economy, with a per capita GNP that is among the highest in the world (US$17,740 in 1990) and a large percentage of the economically active population working in the service sector. All social indicators point to a high standard of living: social services are developed and widespread, the ratio of hospital beds per inhabitant is 6 for every 1000, that of automobiles 1 for every 2 inhabitants, and that of telephones 1 for every 1.8. Over 7 million kWh of energy per capita are produced annually, and approximately 70% of the population are homeowners. This does not mean that the country is spared certain inevitable problems related to the international economic situation, such as the global economic slowdown and the competition of other countries in markets for such products as meat, wool, and wheat that Australia has traditionally exported. These problems are mirrored by a rise in unemployment (almost 8% in 1990) and inflation. To contain the latter, during the second half of the 1970s the government placed controls on taxes, monetary policy, wages, and foreign trade, with overall satisfactory results. The country's exceptional economic potential is tied primarily to its great wealth of natural resources, still only partially exploited. On the other hand, Australian society has generally been conservative and jealous of its prosperity (based in part also on a forward-looking trade union policy in terms of demands and benefits), an attitude that is manifested in the country's restrictive and selective immigration policies. However the resulting scarcity of labor has somewhat slowed possible further economic development. This problem is further exacerbated by communication difficulties with certain areas in the interior, where some of the country's important mineral reserves are located. There is now a major opening toward nearby southeast Asia, with the consequent possibility of important future development expected to result from Australia's integration into the South Pacific geo-economic region.

Agriculture and livestock. Agriculture still plays quite an important role in the Australian economy, although it currently contributes less than 15% of GNP, largely due to the development of other productive sectors.

Farmland and orchards take up approximately 6% of the country's land area; prairies and permanent grazing lands over 54%, forests and woodlands almost 14% while the remainder of the land is uncultivated and nonproductive. Farming is limited to the coastal region facing the Pacific, Tasmania, the Murray-Darling basin, and the region around Perth. The principal problems facing Australian agriculture include a scarcity of water in many interior regions and frequently irregular rainfall, which can be scant or violent, and in some areas impoverishes the soil, carrying away its fertilized surface. Expansion of irrigation systems also presents difficulties, in part due to the danger of excessive exploitation of the phreatic strata. In Australia, the problem of irrigation has always been the center of debate, as described by Mary Ann

Socioeconomic data

Income (per capita, US$)	17,740 (1990)
Population growth rate (% per year)	1.4 (1980–89)
Birth rate (annual, per 1,000 pop.)	15 (1989)
Mortality rate (annual, per 1,000 pop.)	7 (1989)
Life expectancy at birth (years)	77 (1989)
Urban population (% of total)	86 (1989)
Economically active population (% of total)	49.4 (1989)
Illiteracy (% of total population)	0.5 (1991)
Available nutrition (daily calories per capita)	3,322 (1989)
Energy consumption (10^6 tons coal equivalent)	110.6 (1987)

Harrell in her recollections of a journey in the state of Victoria:

In this century dams and locks and weirs have stabilized the Murray system, allowing irrigation. "This country wouldn't be worth two bob without water; it wouldn't feed a billy goat," said Don Oberin of Echuca as we drove westward to visit his dairy farm. "Out here it's flat all right; that little range there's a landmark and it's 145 feet high." The road ran straight for nearly 20 miles. "See the condo?" I didn't. It proved to be a mulga tree, all of ten feet high, with two magpie nests. We passed sheep fretting in the relentless sun, shoving their heads under one another's bellies for a spot of shade. Green replaced brown, abruptly: irrigated land.

Another difficulty, namely the scarcity of fundamental components in the soil, particularly phosphorus, has been overcome through the massive use of fertilizers. As a result, agricultural production, while rather variable from year to year, is showing decided growth.

The high degree of mechanization and utilization of advanced technologies and structures currently allows a small number of skilled workers (equal to approximately 6% of the economically active population) to meet domestic needs and to guarantee a high level of exports in some sectors. Australian farms are generally family-owned, although in some areas (such as cheese production) tenancy leases are relatively common, or there are large investment companies in charge of management (as in many of the immense grazing "stations"). The average farm is about 350 acres [140 ha], but their size can vary from a couple of acres (which is the case for large specialized truck gardens, nurseries, and poultry farms) to tens or even hundreds of thousands of acres (such as the extensive sheep and cattle raising operations).

Wheat is one of the country's most important crops (10.6 million t in 1991), making Australia the fourth largest exporter of this grain in the world, after Canada, the United States, and France. Wheat is grown mostly on the eastern side of the Great Divide and in the Murray basin. Moderate amounts of barley, oats, corn, rice, rye, millet, and sorghum are also grown. The principal cash crop is sugar cane (3 million t of sugar were produced in 1991), which is grown principally in Queensland and New South Wales; these same territories also cultivate cotton (which is also grown in Western Australia) and tobacco (also produced in Victoria). Fruit (apples, pears, apricots, peaches, pineapples, and bananas) is grown predominantly in the states facing the Pacific; citrus cultivation is widespread in New South Wales and grapes in Victoria and South Australia.

Animal husbandry, traditionally practiced in Australia, still constitutes an important source of income. Sheep farming is particularly important, with 163 million head (75% of which are prized merino sheep) and 603,000 t of wool cleaned in 1991, making Australia the world's largest producer of wool. Most of this activity takes place along a broad coastal strip in Western Australia and in a vast arid or semi-arid interior region that stretches from Queensland to South Australia. The grazing lands often extend over some hundreds of acres, fenced in to protect the pasturelands from rabbits and the sheep from dingos. Approximately 90% of the wool produced is exported, chiefly to Japan, the countries of the former Soviet Union, and the EC markets. Cattle raising is also important (23.4 million head in 1991); milk cows are generally raised intensively on farms that average 250 acres [100 ha] in area, located in the southwest and along the Pacific coast. Cheese production is abundant. Beef cattle are allowed to range over wide areas in the Northern Territory and along the Queensland coast, where they are left in a wild state on farms that stretch for thousands of acres, and where small numbers of herders control the livestock, communicating by radio, airplane, and helicopter. The processing and export of frozen meat is significant, and the raising of fowl (ducks, geese, and chickens) and pigs is expanding.

The relatively meager forest land is located for the most part on the east coast of Cape York, in the southwestern region of the Great Divide, in Tasmania, and in the coastal region south of Perth. Modest amounts of valuable woods are taken from the forests, including numerous types of eucalyptus, oak, conifers, and acacia. In 1989 over 706 million ft^3 [20 million m^3] of wood was forested, two thirds of which was used for construction, the rest for paper, plywood, and wood pulp. About 6% of the total forest area is currently set aside as national parklands.

Despite abundant fish in the waters surrounding Australia, fishing is a secondary activity for a population accustomed to seeking and finding its protein needs through livestock raising. The quantity of fish unloaded is rather modest overall; commercial production is based principally on tuna, salmon for canning, mullet, shark, and whiting; shrimp and lobster are the most valuable fishing resource and constitute most of the exported catch.

Mining resources and industry. During World War II Australia was transformed, in slightly less than one generation, from a predominantly agricultural state into a country with a solid industrial structure. Currently industrial activities employ approximately 27% of the economically active population and account for 50% of the country's exports and 35% of GNP. The abundance of natural resources is one of the most important factors that has allowed the development and consolidation of this economic sector, which is now extremely varied and diversified. Australia is rich in numerous raw materials, and from the initial exploitation of gold and coal to the recent discovery of rare tantalum (used in the electronics and aerospace industries), mining has become progressively more productive.

Craig McGregor has described the discovery of gold as the greatest upset in Australian history:

In 1851, gold was discovered at Bathurst in New South Wales, and then a few months later at Ballarat, only 100 kilometres from Melbourne in the recently separated colony of Victoria.

The colonial establishment looked on the finds with horror. The Sydney Morning Herald predicted "calamities far more terrible than earthquakes or pestilence", while the Bathurst Free Press, closer to the scene of the action, declared that "a complete mental madness appears to have seized every member of the community". They had a point. Virtually overnight, Australian cities emptied in a fortune-hunting stampede, and, as word spread round the world, boatloads of eager new immigrants jammed Australian ports.

The people came from every social class. "There were merchants, cabmen, magistrates and convicts," wrote one observer, "amateur gentlemen ... fashionable hairdressers and tailors, cooks, coachmen and lawyers' clerks and their masters, doctors of physics and music, aldermen, an ADC on leave, scavengers, sailors, a real live lord on his travels—all levelled by community of pursuit and of costume."...

Certainly, the goldfields brought immense wealth to the colonies. At peak production, the Victoria fields yielded something like a third of the world's supply. Their most important contribution, though, was not to be measured in precious metal, but in the people who came to seek it. Successful or otherwise, most of them stayed on. In 10 years, the population of the country trebled, and it became obvious that Australia was no longer a colonial backwater to be administered from London for the convenience of the British government.

Australia is the world's largest producer of bauxite (approximately 44 million t in 1990), which is extracted mostly in the Gulf of Carpentaria region and the area of the Darling Range (Western Australia); the Weipa deposits in Queensland are one of the richest on earth. Australia is also fourth in the world (after Brazil, China, and Russia, and on a par with the Ukraine) in the production of ferrous minerals (approximately 68 million t of iron in 1989); most of the ore mined throughout Western Australia has a higher than 50% metal content. The production of zinc and lead is also essential to the economy (Australia's production is, respectively, second and first in the world), with principal reserves located in Queensland, New South Wales, and Tasmania.

Copper, nickel, manganese, tin, and uranium complete the country's mineral resources. Uranium is particularly abundant in the Northern Territory and in Western Australia, but its extraction and commercialization raise political and public opinion problems.

Most of the electrical power produced is of thermal origin; the country's principal energy source is coal (over 161 million t in 1989), which is found in New South Wales and Queensland. Lignite, also abundant, is taken from immense open-cut mines in Gippsland for the large thermoelectric power plants of Victoria and other states, to which the mineral is sent compressed into the form of briquettes. The first oil field was discovered in 1961 in Moonie, 185 mi [300 km] west of Brisbane; since then other hydrocarbon reserves, both liquid and gaseous, have been identified and exploited in Victoria, Queensland, South and Western Australia, and offshore along the coast of the Northern Territory. The country still imports approximately a third of its crude oil. The refining industry is very active, with installations in Geelong, Kurnell, Altona, and Hamilton, where imported oil is also processed. On the whole, Australia does not avail itself of its abundant hydroelectric resources; in this regard the greatest potential is in Tasmania and on the eastern slopes of the Great Divide.

Despite state and federal incentives for decentralizing the industrial sector, the largest industries in Australia are located for the most part close to the sources of energy and to the largest cities. The most important industrial areas are in or near Sydney (including the coastal centers between Port Kembla and Newcastle), Melbourne (as far as Latrobe Valley), Brisbane, Adelaide and the coastal region of the Spencer Gulf, and the area of Perth and Fremantle. The iron and steel industry is especially well developed, with considerable cast iron and steel production. Numerous metallurgical installations process copper, lead, zinc, and aluminum. Among the machinery industries (for which Sydney is the traditional epicenter), aeronautics and automobile production are well established; the electrical and electronics industries are also important. The chemical sector manufactures a great number of semi-finished and finished products: acids, fertilizers, textile fibers, pharmaceuticals, plastic and synthetic rubber objects, and the like. Textile manufacturing (with the production of cotton and wool textiles and yarns) and the food-processing industry (from canning to pasta; from plants for processing milk and its byproducts to immense slaughterhouses and refrigeration plants at the large meat-shipping ports such as Melbourne, Brisbane, and Adelaide) are also extremely significant.

In terms of advanced technology fields, Australia is very active in space communications. Its tracking stations provide essential support for launches carried out by NASA. There are also important telescopes and observatories for radio astronomy.

Commerce and communications. The service sector constitutes the most important segment of the Australian economy, employing almost 68% of the economically active population and contributing 61% to the national income. Within this sector foreign trade is of fundamental importance: the primary trading partners are, in descending order, Japan, the U.S., and Great Britain. Australia exports chiefly minerals (coal, aluminum, lead, zinc, and iron), agricultural products (wheat and sugar), and livestock products (wool and meat), while it imports mainly machinery and equipment to support the mining and manufacturing industries. As mentioned, Australia has recently sought new relationships with markets in Asian and Oceanic countries, making incisive commercial inroads in the geopolitical area of the South Pacific.

Financial activities are also well developed. The banking system includes commercial and merchant banks, savings institutions, and insurance companies, which transact business both domestically and abroad. The 1980s saw a growth in investments of foreign capital.

The development of transportation and communications has traditionally been of fundamental importance to the Australian economy. Indeed, these fields are vital in such a vast country, whose inhabitants have always had to combat the "tyranny of distance." The considerable distance between major cities and the presence of many isolated areas are among the factors that have contributed to an early and, over time, increasingly well developed air transportation system. Numerous airlines provide regularly scheduled flights on a network of routes that covers approximately 124,000 mi [200,000 km], and includes over 400 airports, the main ones of which are in Sydney, Melbourne, Brisbane, Adelaide, Canberra, and Perth. The Royal Flying Doctor Service, conceived back in 1928, is well known; today it operates from 12 central bases, serving an area of over 1 million mi^2 [3 million km^2] with specially equipped aircraft, and aiding over 100,000 patients annually.

The road network exceeds 525,000 mi [850,000 km], of which approximately half are paved. The state capitals and major centers are all linked by superhighways, traveled by over 9 million vehicles.

Railroad lines extend for almost 25,000 mi [40,000 km], linking the principal centers and connecting certain mining, agricultural, and industrial areas to the ports. The longest line connects Perth and Sydney and is almost 2500 mi [approximately 4000 km] long.

In 1990 the merchant marine had 721 ships at its disposal, with an overall gross tonnage of 2.75 million t. The principal

ports coincide with the state capitals or with industrial centers (such as Port Hedland in Western Australia, Newcastle in New South Wales, and Gladstone in Queensland). Sydney is clearly the busiest port, and a destination point for the most important trade routes of the Indian and Pacific oceans.

Telephone, telegraph, and telex services are well maintained and extensive. Information systems are varied and diversified; there are daily newspapers and magazines, radio and television stations, both state and private, national and ethnic. Within the service sector foreign and domestic tourism plays a significant role, and there has been rapid growth in recent years. The boundless interior spaces, ocean beaches, islands of the Great Barrier Reef, parks and national reserves with their natural riches, and the modern and lively cities are among the destinations most visited by tourists, who can avail themselves of a modern infrastructure that is able to meet their growing demands.

Historical and cultural profile. ***Prehistoric Australia.*** Stone tools, skeleton remains, and rock paintings constitute the scanty remains on the basis of which scholars have attempted to fathom the most ancient human past on Australian soil. According to some it is a past that dates back 40,000 years, according to others, even more. During the last glacial epoch migrations from Asia were facilitated in part by the lower water level of the ocean. These peoples first settled in the northeastern region, and over the course of millennia the early inhabitants moved down along the coasts and rivers toward the south and the interior of the continent, which, despite its scarcity of game and edible plants, still presented an environment favorable to human settlement. As Craig McGregor writes:

> *They came from South-East Asia, and for the most part they walked.... Like every human being at the time, they were hunter-gatherers, foraging in small bands; they may have fled in haste from violent neighbours or idly meandered after game and wild fruits, taking generations in the crossing....*
>
> *Their continent, however, was not a paradise. The same climatic changes that had isolated it from the rest of the world had stricken much of it with perpetual drought, and few areas offered an easy living. Like all hunter-gatherers, they were semi-nomadic and ranged over vast tracts of territory to make the most of a scanty food supply. Materially, they had few possessions, and no weapon was more advanced than a stone-tipped wooden spear or the curious throwing stick they called a boomerang; except in the cooler, southern regions, they rarely troubled to make clothing.*
>
> *Culturally, though, their lives were rich and complex. Over the quiet, uncharted centuries, they developed a marvellous web of totems and taboos that not only allowed them to harvest the frugal necessities of life from an often forbidding environment, but also provided intense spiritual satisfaction. Everything was magical; but it was usually a magic based upon acute observation of the natural world. Everything was part of the whole. A man could see his ancestors in a rock or a star, or in a kangaroo upon a far horizon. A whole people lived in a state of permanent communion with the world about them, transcending birth and death and time itself. That timeless lifestyle lasted for millennia and, undisturbed, might have lasted for millennia more. But only distance and the ocean protected it; half a world away, in Europe, a very different kind of people, aggressive and ambitious, were finding how easily distance could be abolished.*

Millennium after millennium, the life of these aboriginal populations remained unchanged, with a combination of extremely simple material conditions (nomadism, hunting and gathering activity, exclusive use of wood for tools) and surprisingly rich social and symbolic structures.

In terms of social organization, local groups ("bands") related to contiguous groups through increasingly expanding systems, up to tribal and super-tribal structures based on territory and regulated by complex kinship ties and totemic bonds.

From a spiritual viewpoint the Aborigines have carried down to modern times a worldview centered on the notion of mythical ancestors and invisible forces. Images of "wandjina," the mysterious "creators" that inhabit a restless and ghostly realm, and of propitiatory elves or spirits, depicted for magical-sacred rituals, have been found in cave paintings throughout the Kimberleys and Arnhem Land. An Australian myth tells about the origin of the Sun:

> *In ancient times there was no Sun; only the Moon and stars shone together in the sky. There were no human beings on earth, only birds and some animals larger than those we know today. One day Dinevan the emu and Bralgah the gru took a walk together. But a misunderstanding arose between them and they began to quarrel. Bralgah flew into a rage and hurled himself at Dinevan's nest, seized an egg, and with all his strength flung it skyward, where it hit a pile of firewood and broke into pieces. The yellow egg yolk scattered all over the pile of firewood and ignited it, so that the entire world was suddenly illuminated by the burning wood. Until then there had been only a very weak light on earth, and now those below remained blinded by the intense glare of the fire.*
>
> *The good spirit who lives in the heavens liked the light and thought it would be very nice to have a fire like that every day. And so he established this custom: every night his servant spirits would gather firewood, and when the pile was ready he would bring out the morning star and announce that the fire was ready to be lit.*
>
> *But he noticed that the visible announcement of the morning star alone was not enough to wake the sleeping people on Earth and he began to look for a sound effect to accompany the signal. But he wasn't able to find an individual capable of producing the appropriate sound.*
>
> *One evening he was listening to the "cock-a-doodle-doo" laugh of the rooster. "This is what I need!" he said and gave the bird the task of laughing every morning, before the pyre was ignited. If he neglected his duty, the pile of wood would not be lit.*
>
> *Since then "cock-a-doodle-doo" has done his job so well that he always remembers to laugh at the right moment every morning, and he finishes by crying out his name three times: "Cock-a-doodle-doo! Cock-a-doodle-doo! Cock-a-doodle-doo!"*
>
> *In the morning when the spirits light the fire it is not very hot at first. But toward midday, when the entire pile is burning, it becomes quite hot on Earth. Then the heat gradually diminishes until, in the evening, only a tenuous red glow remains, which is quickly transformed into gray ashes. Only some small wood timbers are left burning during the night, carefully wrapped in clouds, so they can be easily ignited again when morning comes. If the rooster, a very irritable creature, were ever made fun of, it would cease crowing in the morning and the Earth would once again be enveloped in darkness*

Precisely because of the preeminence accorded the supernatural element over the material, the world of the Aborigines was

unable to withstand the colonizing advance of the Europeans and was threatened with extinction. In the late 18th century there were perhaps 300,000 Aborigines; according to the 1930 census there were only about 61,000 (plus 18,000 of mixed descent). Although the subsequent impressive growth of their population has brought the number much closer to pre-European levels, the Aborigines make up just 1.5% of the current total population of the country.

Colonization. Until modern times the Australian continent remained nearly completely isolated, even though Charles Darwin's 1879 discovery of a jade statuette from the 14th century supported the idea of a possible presence of Chinese navigators along the northern coasts. The Europeans who, since ancient times, had wondered about the *Terra australis incognita*, hypothesized by Ptolemy, did not reach the continent's shores until the 17th century, with the systematic explorations of the Dutchmen Willem Jansz (1605), Dirck Hartog (1616), and Abel Tasman (1642 and 1644). The Spanish expedition of Luís Váez de Torres (1605) came close, discovering the Torres Strait but failing to sight the Australian landmass. The apparent poverty of the territory, however, discouraged further expeditions for more than a century, until the arrival of the Englishman James Cook (1770), whose discoveries led to British settlement of the Australian continent, in particular the eastern region which he called New South Wales.

The importance of this discovery was confirmed less than two decades later, when Great Britain began to take an interest in Australia, almost as a provisional solution to compensate for the loss of the American colonies, which in the meantime had obtained their independence. In particular, without the possibility of using Virginia as a penal colony, ships transporting convicts were directed toward distant New South Wales. The community that grew up in the area called Sydney Cove, after the Home Secretary, Lord Sydney, was certainly unusual: a citizenry composed of convicts serving life terms and prison guards, government officials and free emigrants ("exclusives"), and freed prisoners ("emancipists"). Among the convicts was a small number of women, for the most part former prostitutes. In the early decades of the 19th century the breeding of Merino sheep, which proved to be quite profitable, gave a certain homogeneity to this varied aggregation of people and pushed the initial colony to expand in search of new pasturelands and new terrain.

Thus the first half of the 19th century saw the concomitant phenomena of the country's economic takeoff, systematic colonization to the detriment of the Aborigines (with several major exploratory expeditions into the central desert region), and the rise of the sheep farmers as a dominant class, with their abusive takeover of vast grazing lands in the interior.

As the colonists moved away from New South Wales they gradually established other crown colonies: Tasmania, Western Australia, South Australia, Victoria, and Queensland. These gained autonomy in 1850, with the passage of the Australian Colonies Government Act, and they were given one of the most advanced constitutions of the time, which provided for universal male suffrage (although limited to whites) and the secret ballot.

The first literary works, which date back to the 1820s, were based on English literary models, but they reflected the problems and sentiments of a society emerging from colonization.

During the second half of the 19th century the six colonies all underwent, in various ways, an impetuous process of development. The discovery of gold fields unleashed a "gold rush" and a consequent immigration explosion that, in the span of fifty years, brought the population from 400,000 to 4 million. To livestock raising was added the cultivation of cotton and sugar cane, for which a veritable "slave trade" of 11,000 Malaysians was launched, despite British opposition to forced labor. On the other hand, the growth of the mining, construction, and manufacturing industries led to the establishment of a strong and unionized working class, which at the end of the century found political expression in the Australian Labor Party. Pressure exerted by the working class was responsible for important social advances, such as the eight-hour workday, compulsory and free education, and women's suffrage (1894–1902).

The 20th century. The passage from the 19th to the 20th century was a period of general ferment in Australia, not only because of the affirmation of basic rights in the social and political arenas, but also due to the development of nationalism. It is not coincidental that the country's culture, until then a simple reflection of Anglo-Saxon culture, began to claim a specifically Australian identity. Between the last decade of the 19th century and World War I the Sydney magazine *Bulletin* became a rallying point for intellectuals and artists with nationalist and egalitarian (if not republican) tendencies. The literary results of this climate were notable, and in the ballads of A. B. "Banjo" Paterson and the novels of Henry Lawson, Tom Collins, and Marcus Clarke, with their characters that pulled themselves up out of the bush and their folkloric themes and sense of intact and boundless nature, Australian literature reached still unsurpassed levels.

These same themes inspired contemporaneous developments in painting; the works of Tom Roberts and other landscape painters of the so-called "Heidelberg School," are important for their artistic achievements as well as their documentary value.

During this period new poets and prose writers emerged, such as Katharine Susannah Prichard, author of *The Pioneers*; and *Black Opal*. Vance Palmer was another novelist from this period (*The Man Hamilton*, *The Swayne Family*, and *Legend for Sanderson*). It could be said that after 1920 the novel took root in Australia at the expense of other literary genres that had been successful until then, particularly in the 19th century (namely the story and the ballad). Author Henry Handel Richardson (pen name of Ethel Florence Lindesay Robertson) wrote some significant novels, including a trilogy, *The Fortunes of Richard Mahony*.

In the 1930s the big city, with all its contradictions, difficulties, and problems, became the dominant theme in novels (Leonard Mann, *A Murder in Sydney*). During this period the short story came back into fashion in the work of Vance Palmer and others, as did poetry, particularly by Robert FitzGerald, Hugh Raymond McCrae, and other followers of the "universal poetry" movement.

On January 1, 1901, the Commonwealth of Australia was proclaimed, in response to widespread nationalist feeling in the country. Without cutting all ties to the British crown, an independent, federal-type state was established, made up of the six original former colonies, plus the Northern Territory and Papua.

After the establishment of the new state, government rule passed back and forth between the liberals (whose policies

toward minority immigrants were conservative and often discriminatory) and laborites. The latter group had the task of coping with the negative repercussions of the global economic crisis in the 1930s, which abruptly interrupted the preceding boom period and resulted in a third of the Australian people being unemployed. However, the country's transformation into an industrial power resumed after World War II, once the Japanese attack in the Pacific was thwarted, thanks to an enormous wartime effort that cost 30,000 human lives and a close alliance with the U.S. (General Douglas MacArthur had his general headquarters in Melbourne). During World War II Australia embarked on a period of economic prosperity that was based on intensified ties with the U.S., a new and consistent receptivity to migratory flows, particularly from Europe (with Italians and Greeks in the lead), and a stable political arena, dominated by the Liberal Party's Sir Robert Gordon Menzies's uninterrupted term as head of state from 1949–66.

In the last thirty years the country's domestic situation has become more complicated and contradictory, characterized on an economic level by the growing threats of inflation and unemployment, and on the political level by changes in power between the Liberal and Labor parties and by the advance of the new Liberal-Reformist Party. The role of international alliances is also more in flux, and along with the United States as a traditional partner (occasionally at odds with each other), there have been openings toward Japan and China. This phase has spawned its own reaction, a call from many sides for a new affirmation of "Australian-ness" as a breaking away from foreign cultural as well as economic dependencies. A host of artists has surfaced, in the fields of literature, painting, film, and music, who are expressing themselves with strong originality.

In literature, one of the outstanding authors of recent decades is Patrick White, who was awarded the 1973 Nobel Prize for Literature for his novel *The Eye of the Storm*. Significant poets have included Alec Derwent Hope, James McAuley, Judith Wright, David Campbell, Chris Wallace-Crabbe, Les Murray, Francis Webb, Michael Dransfield, Bruce Beaver, and David Malouf. There have also been modest achievements in drama, thanks to playwrights Ray Lawler and Alan Seymour and to developments in Melbourne in the 1960s, with the work of the young satirical authors David Williamson, Jack Hibberd, and Barry Oakley. The novel as a literary genre is enjoying particular vitality, with many followers of Patrick White and Hal Porter, such as Frank Hardy, David Ireland, Thea Astley, Shirley Hazzard, Dorothy Hewett, George Johnston, and Christina Ellen Stead.

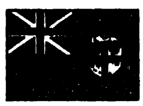
Many Australian filmmakers have received international recognition, such as Bruce Beresford, Gillian Armstrong, Jill Campion, and, particularly, Peter Weir. The affirmation of a mature cultural identity has necessarily implied a rediscovery of the distant roots of this identity, with an emphasis on the culture and claims of the subjugated Aboriginal groups, which have asked to be recognized with full rights as Australian citizens.

On January 26, 1988, Australia celebrated the bicentennial of its political existence, or, more precisely, commemorated the arrival of the first British colonists. The international press gave the event significant coverage:

Many problems are facing this country that has begun its third century of existence. In 1947 the population numbered 7.6 million, more than 90% of Anglo-Celtic origin. In 1973 immigration was opened up to practically everyone, and today the 16 million inhabitants represent more than 120 countries of origin. Over 100,000 refugees from Vietnam, Laos, and Cambodia have arrived in Australia since 1975. The Hawke government has decided to encourage immigration in every way to revitalize the country's economy.

Thus the old policy of assimilation into Anglo-Celtic culture has been abandoned in favor of the construction of a multiracial society. Radio and television transmit programs in 50 different languages. The goal is international as well as domestic, to reduce Australia's difference from the states and microstates of the South Pacific in order to participate more effectively in the overall dynamism of the region.

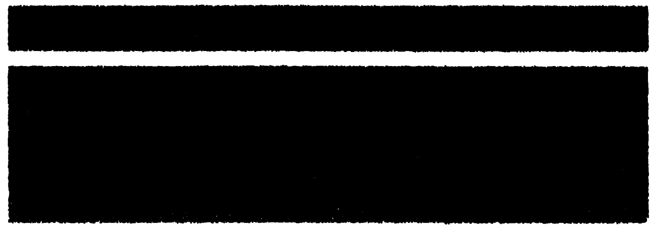
FIJI



Geopolitical summary

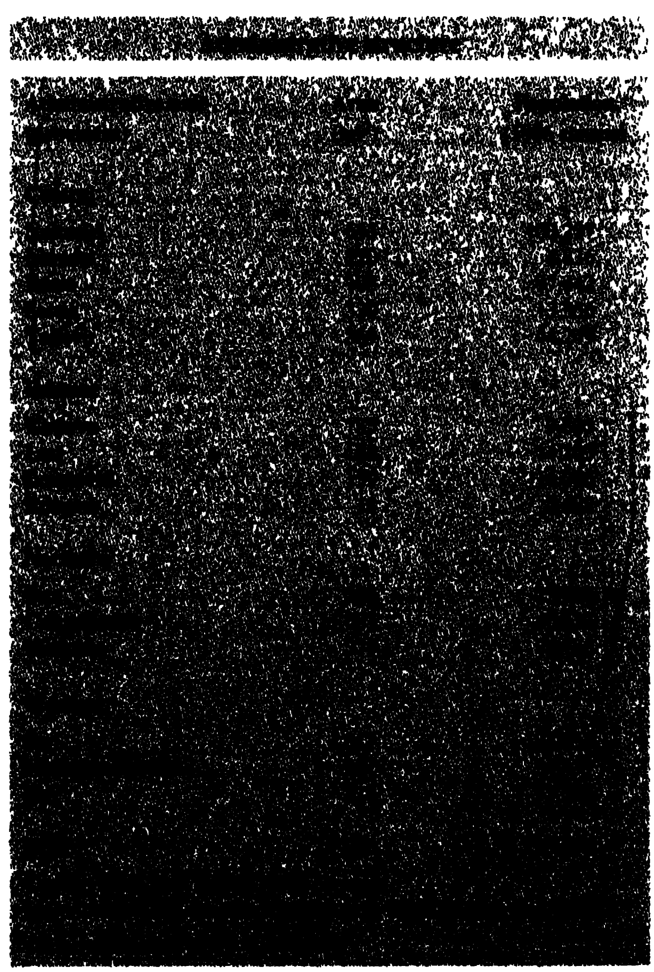
Official name	Sovereign Democratic Republic of Fiji
Area	7,056 mi^2 [18,274 km^2]
Population	736,000 (1990 estimate)
Form of government	Independent republic, formerly a member of the Commonwealth (until 1987). Executive power is held by the prime minister. The 1970 constitution is no longer in effect.
Administrative structure	15 provinces
Capital	Suva (pop. 69,665, 1986 census)
International relations	Member of UN, SPF, (South Pacific Forum), and associated with the EC.
Official language	English and Fijian, Hindi widely spoken.
Religion	Christian 53% (8% Catholic); Hindu 38%, Muslim 8%, other 1%
Currency	Fiji dollar

Natural environment. The archipelago of Fiji is made up of approximately 320 islands arranged in a horseshoe configuration over more than 38,600 mi^2 [100,000 km^2] of the southwestern Pacific Ocean in Melanesia. The two principal islands, Viti Levu and Vanua Levu, account for almost 90% of the total area. The territory's ancient origins are predominantly volcanic, but eruptive activity has long ceased and the land has been subject to exogenous forces. The islands are surrounded by numerous coral-reef formations. The interior of the main islands is mountainous and inhospitable (with elevations exceeding 3300 ft [1000 m]), while the coasts are flat. The subtropical climate is hot and humid; temperatures are generally mitigated by sea breezes and by the southeast trade winds, and rainfall is more abundant along the southeastern slopes exposed to these trade



winds (over 117 in. [3000 mm] annually). These areas are dominated by ombrophilous forest, which gives way to sparse forest growth and tree-lined savanna in the less humid areas.

Population. The current population is 48.6% Indian, 46.3% Fijian, and the remainder European, Chinese, and Polynesian. The large Indian community is a result of forced immigration imposed by the British at the end of the 19th century in order to increase the labor supply on the sugar-cane plantations. Only a hundred or so of the 320 islands are inhabited, with over 730,000 people in an overall area of 7054 mi^2 [18,274 km^2] and a density of 104 inhabitants per mi^2 [40 per km^2], one of the highest of the Pacific archipelagoes. Two thirds of the population is concentrated on Viti Levu, and the rest mostly on Vanua Levu. Approximately 39% of the population is urban, predominantly Indians and Europeans involved in commercial and industrial activities. The principal population centers are located along the coasts; the most important of these is the capital, Suva, located



Socioeconomic data

Income (per capita, US$)	1,730 (1990)
Population growth rate (% per year)	1.4 (1980–89)
Birth rate (annual, per 1,000 pop.)	26.8 (1989)
Mortality rate (annual, per 1,000 pop.)	5 (1989)
Life expectancy at birth (years)	68.3 (1989)
Urban population (% of total)	38.7 (1989)
Economically active population (% of total)	–
Illiteracy (% of total population)	13 (1991)
Available nutrition (daily calories per capita)	2,785 (1989)
Energy consumption (10^6 tons coal equivalent)	282 (1987)

on Viti Levu. Suva is a dynamic tourist center, as well as a lively commercial and shipping hub, site of an international airport, and home to a university attended by students from the English-speaking islands of the Pacific.

English and Fijian are the official languages; the Indians speak Hindi. Methodism and Hinduism are the most widely practiced faiths.

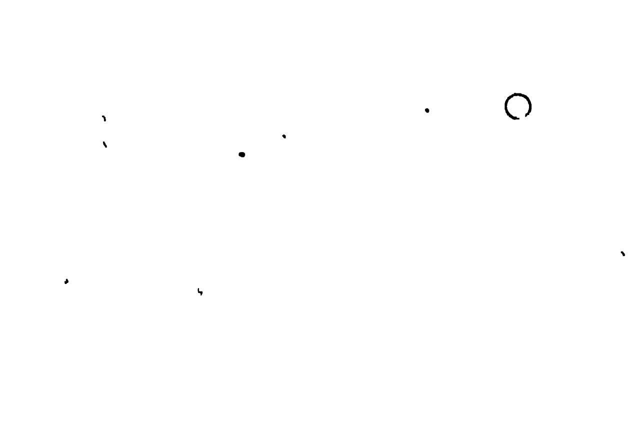
Economic summary. The country's plantation agriculture is based primarily on the cultivation of sugar cane and secondarily of coconut palm and bananas; there is lesser production of rice, sweet potatoes, cassava, tobacco, and cotton. The forests and fishlife resources are substantial. For some time there has been an attempt to avoid the dangers of single-crop agriculture (sugar has been subjected to considerable instability on the international market), with great value placed on the developing tourist industry.

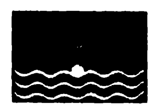
The principal mineral resources are gold, silver, and copper. While basic manufacturing activity is lacking, there is a rather extensive food production sector (consisting in particular of sugar refineries and oil mills); lesser industries include cement works, breweries, and tobacco and cotton processing.

Sugar is the chief export, while the main imports are industrial products. The principal trading partners are Australia, New Zealand, Great Britain, and Japan. Transportation facilities consist of 2989 mi [4821 km] of roads, a modest railroad system, and expanding maritime and air services.

Historical and cultural profile. Before their discovery by Europeans, the Fijian islands were populated by groups of Melanesian origin who had reached a high degree of civilization. The islands were visited by James Cook (1774), William Bligh (1787), James Wilson (1797), and Jules S. C. Dumont d'Urville (1838), before becoming a British crown colony in 1874. The vast sugar-cane and cotton plantations desired by the English necessitated the importation of foreign workers, mainly from India. The number of immigrants was so great that problems of coexistence arose between the Fijians and the Indians. The latter soon became a majority, and this conflict then assumed center stage in the archipelago's history. There were racial clashes in 1959 and on the eve of independence, obtained in 1970 within the Commonwealth structure. In 1987 a coup d'état led by Colonel Sitiveni Rabuka broke off the final tie to the former mother country and proclaimed a republic, abrogating the constitution of 1970 with the goal of guaranteeing the hegemony of the Fijians. Three years later the government was returned to civilian rule.

KIRIBATI





Geopolitical summary

Official name	Republic of Kiribati
Area	328 mi² [849 km²]
Population	72,335 (1990 census)
Form of government	Presidential republic within the Commonwealth. The head of state also acts as governor. The legislative organ is the House of Assembly, elected every 4 years.
Administrative structure	3 island groups.
Capital	Bairiki, on Tarawa Atoll (pop. 25,154, 1990 census)
International relations	Member of the Commonwealth and SPF (South Pacific Forum); associated with the EC.
Official language	English and Gilbertese
Religion	Majority Catholic and Protestant
Currency	Australian dollar

Natural environment. The territory of Kiribati includes the Gilbert Islands, Ocean Island (or Banaba), the Phoenix Islands, and the Line Islands—some forty atolls that are scattered over an extremely large area of the Pacific Ocean immediately north and south of the equator and between longitudes 169° E and 148° W of Greenwich (and thus are traversed by the International Date Line). Their average altitude ranges from 10 to 26 ft [3 to 8 m] above sea level. The climate is equatorial, with rainfall ranging from 39 in. annually [1000 mm] along the equator to 117 in.

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[3000 mm] on the islands lying further north and south.

Population and economy. The Micronesian and Polynesian population speaks Gilbertese and English and is predominantly Protestant. The average population density is 220 people per mi^2 [85 per km^2], but only about twenty of the islands are permanently inhabited, and approximately a third of the population is concentrated on the atoll of Tarawa, in the Gilbert Islands, where the capital, Bairiki, is located.

The economy is based on subsistence agriculture (taro, breadfruit, bananas, and vegetables), the cultivation of coconut palms, and fishing, an activity which is expanding. The termination of phosphate production on Ocean Island due to depletion of the reserves there has caused a serious economic crisis, resulting in an 80% decrease in earnings.

Trade takes place mainly with Great Britain, Australia, and Fiji. Transportation is assured through the ports of Ocean Island and Tarawa.

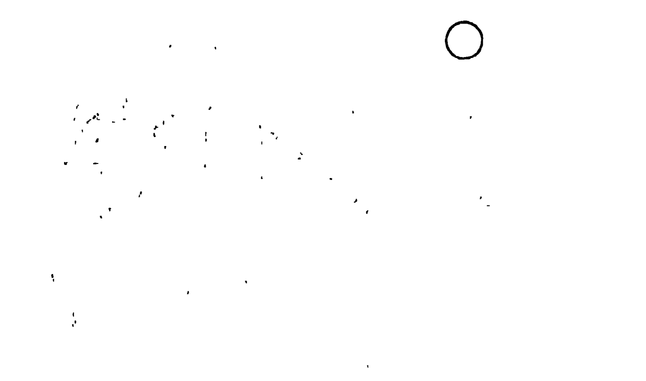
Historical profile. The Gilbert Islands, discovered by Europeans in 1769, are named for the English adventurer Thomas Gilbert, who arrived there in 1788. The Gilbert and Ellice island groups were merged under a British protectorate in 1892 and became a crown colony in 1915. The Ocean (1916), Christmas (1919), and Phoenix (1937) islands were later added to this group. Occupied by the Japanese during World War II, they were retaken by the Americans after bitter combat (the battles of Makin and Tarawa, 1943).

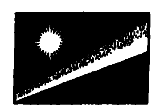
Four years after the Ellice Islands (later called Tuvalu) broke away from the colony (1975), the Gilbert Islands gained independence within the framework of the British Commonwealth, and became known by the name Kiribati.

Socioeconomic data

Income (per capita, US$)	760 (1990)
Population growth rate (% per year)	1.2 (1985–90)
Birth rate (annual, per 1,000 pop.)	17 (1990)
Mortality rate (annual, per 1,000 pop.)	5 (1990)
Life expectancy at birth (years)	55 (1989)
Urban population (% of total)	33.5 (1989)
Economically active population (% of total)	–
Illiteracy (% of total population)	10 (1991)
Available nutrition (daily calories per capita)	2,952 (1989)
Energy consumption (10^6 tons coal equivalent)	.10 (1987)

MARSHALL ISLANDS





Geopolitical summary

Official name	Republic of the Marshall Islands
Area	70 mi^2 [181.3 km^2]
Population	49,000 (1991 estimate)
Form of government	Presidential republic; the head of state and of the executive branch is elected by the bicameral Legislative Assembly every 4 years.
Administrative structure	24 districts
Capital	Dalap-Uliga-Darrit (pop.14,649, 1988 census)
International relations	Member of UN
Official language	English and Marshallese
Religion	Christian (Protestant 90%, Catholic 8.5%); Baha'i
Currency	U.S. dollar

Natural environment. The Marshall Islands are located in the Micronesian region of the northwest Pacific, east of the Caroline Islands (Federated States of Micronesia) and north of Kiribati, at latitude 10° N and longitude 170° E. The islands emerge from an underwater ridge that traverses the bottom of the Pacific Ocean and extends southward with the Gilbert, Tonga, Kermadec, and New Zealand archipelagoes. The Marshalls consist of two principal island and coral atoll alignments that stretch for approximately 806 mi [1300 km], predominantly in a northwest–southeast direction, and cover an area about 150 mi [240 km] wide. The outer island group, located to the northeast, is made up of the Ratak (or Sunrise) Chain; the inner group, to the southwest, comprises the Ralik (or Sunset) Chain. The archipelago (approximately 1150 islands and islets clustered in some 30 atolls), rather modest in size and nearly flat, occupies a total land area of 70 mi^2 [181 km^2], while the total area of ocean covered exceeds 77,200 mi^2 [200,000 km^2]. In the Ratak Chain the Likiep atoll's highest elevation is barely 33 ft [10 m]; in

the Ralik Chain the Kwajalein atoll, with an area of 893 mi^2 [2313 km^2], is the largest in the world. The climate is equatorial, with a temperature that averages approximately 75°F [24°C], fluctuating only slightly, and a year-round rainfall reaching overall levels of 117–156 in. [3000–4000 mm]. However, the northernmost islands have considerably lower precipitation levels, only up to about 20 in. [500 mm] annually. Typhoons are not very frequent, but when they do occur they are devastating. Storms of less force are rather frequent in the spring and autumn. The vegetation is also equatorial in nature; breadfruit, taro, hibiscus, and coconut palm are especially prevalent.

Population and economy. The current population of the Marshall Islands is 49,000 (1991), most of whom are of Micronesian origin, there is a very high birth rate. The population is chiefly concentrated on the Majuro and Kwajalein atolls. Government offices and the presidential palace are located on Majuro (in the D.U.D municipality, which includes the islets of Darrit, Uliga, and Delap).

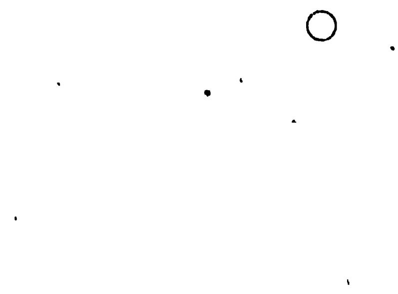
Agriculture (with taro, sweet potatoes, and breadfruit as the basis of a subsistence economy and coconut palm and cocoa grown as speculative crops), livestock raising (pigs), fishing, and tourism are the principal economic activities. Links to the outside world are assured by two airports located on the Majuro and Kwajalein atolls.

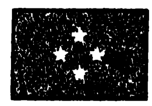
Historical profile. Discovered by the Spanish navigator Álvaro Saavedra (1529), the Marshall Islands were named for an English captain, John Marshall, who landed there in 1788. During the second half of the 19th century some Protestant missions were established, and in 1855 the archipelago became a German colony. On the eve of World War I (1914), the islands were occupied by Japan and then, in 1944, by the United States, which used the Bikini and Eniwetok atolls for atomic testing. After a long period of administration as a United States Trust Territory, the Marshalls became independent in 1990.

Socioeconomic data

Income (per capita, US$)	1,500 (1989)
Population growth rate (% per year)	3.9 (1991)
Birth rate (annual, per 1,000 pop.)	47 (1991)
Mortality rate (annual, per 1,000 pop.)	8 (1991)
Life expectancy at birth (years)	62.5 (1991)
Urban population (% of total)	47.8 (1991)
Economically active population (% of total)	–
Illiteracy (% of total population)	14 (1990)
Available nutrition (daily calories per capita)	–
Energy consumption (10^6 tons coal equivalent)	–

MICRONESIA





Geopolitical summary

Official name	Federated States of Micronesia
Area	270 mi^2 [699 km^2]
Population	110,000 (1991 estimate)
Form of government	Presidential republic with a federal structure. The head of state and of the executive branch is elected by the National Congress every 4 years.
Administrative structure	4 federated states
Capital	Kolonia (pop. 6000, 1990 estimate); the seat of government in Palikir
International relations	Member of UN
Official language	English; Micronesian dialects also spoken
Religion	Christian (predominantly Protestant, also Catholic)
Currency	U.S. dollar

Natural environment. The territory of the Federated States of Micronesia corresponds to over 600 islands in the Caroline Islands archipelago, including the Pohnpei, Truk, Kosrae, and Yap islands, the names of which are also used to denote the four federated states. The islands (a tenth of which are uninhabited), coralline and volcanic in nature, are scattered over an arc that extends for almost 1850 mi [3000 km], between latitudes 5°–8° N and longitudes 137°–164° E. They emerge from underwater ridges, such as the Yap Ridge, an extension of the Marianas

Ridge to the northeast and New Guinea to the south, delimited by the Yap Trench, which has depths as low as 28,200 ft [8597 m] below sea level; and the Kapingamarangi Rise, which encompasses the principal atolls in the federation. A smaller, suboceanic ridge, the Eauripik-New Guinea Rise, emerges between these two main ridges, forming the division between the West and East Caroline Basins.

The archipelago has an overall land area of 270 mi² [699 km²] and its ocean area exceeds 965,000 mi² [2.5 million km²]. The largest islands are Pohnpei (127 mi² [330 km²]), the third largest in all Micronesia, after Guam and Babelthuap (in the Palau Islands), Kosrae (41 mi² [107 km²]), and Yap (38 mi² [99 km²]). They are predominantly mountainous (Pohnpei has peaks rising to 2555 ft [779 m] and Kosrae to 2030 ft [619 m]) and generally covered with dense rainforests that, in the more interior regions, become stretches of savanna. The climate is oceanic-tropical, with average annual temperatures of 73–75°F [23–24°C] and rainfall ranging from 117–156 in. [3000–4000 mm] annually, carried for the most part by the northeasterly tradewinds that tend to taper off from January to March, reaching their greatest intensity during the months that follow and from October to December. The interior of Pohnpei, where up to 390 in. [10,000 mm] of rain can fall yearly, is one of the most rain-drenched locations in the world. The islands are occasionally in the path of violent typhoons (notorious ones hit Pohnpei in 1957 and 1986).

Population and economy. The population (110,000 inhabitants in 1991) is concentrated predominantly on the atolls of Truk and Pohnpei. The original Melanesians and Indonesians were later joined by Spaniards, Japanese, Filipinos, and Americans. The capital, Kolonia, is located on Pohnpei.

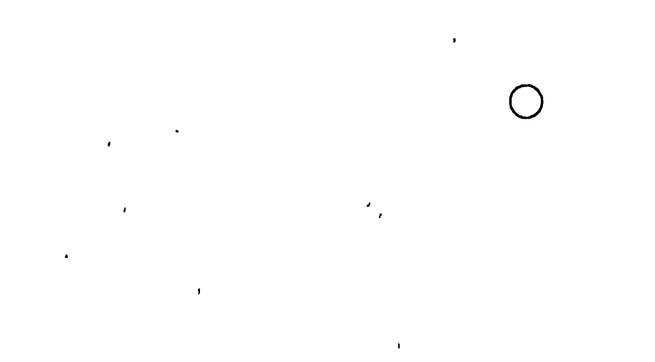
The economy of the Micronesian federation is affected by its small territory and great distances, which make trade and relations with other countries difficult. The basis of subsistence is agriculture and fishing, while mineral resources are rare. The principal sources of income are financial assistance from the U.S. and tourism, which has good prospects.

Historical profile. Discovered in 1528 by the Spaniard Álvaro Saavedra, the Caroline Islands remained under Spanish rule until the end of the 19th century, when they were sold to Germany. Occupied by Japan (1914), they came under U.S. control at the end of World War II, gaining independence in 1990 after a long period of U.S. trusteeship.

Socioeconomic data

Income (per capita, US$)	1,500 (1989)
Population growth rate (% per year)	2.9 (1991)
Birth rate (annual, per 1,000 pop.)	34 (1991)
Mortality rate (annual, per 1,000 pop.)	5 (1991)
Life expectancy at birth (years)	79.5 (1991)
Urban population (% of total)	19.4 (1991)
Economically active population (% of total)	- -
Illiteracy (% of total population)	10 (1991)
Available nutrition (daily calories per capita)	-
Energy consumption (10^6 tons coal equivalent)	-

NAURU



Geopolitical summary

Official name	Republic of Nauru
Area	8 mi² [21.2 km²]
Population	9,600 (1992 estimate)
Form of government	Independent republic within the Commonwealth. The Legislative Assembly is elected every 3 years.
Administrative structure	14 districts
Capital	Yaren (pop. 559, 1983 census)
International relations	Member of Commonwealth and SPF (South Pacific Forum)
Official language	English and Nauruan
Religion	Predominantly Protestant; Catholic 24%
Currency	Australian dollar

Natural environment. The island of Nauru, located west of Kiribati, almost on the equator, is an oval, madreporic atoll surrounded by a coral reef. The narrow sandy beach gives way to a coastal belt only 650–1000 ft [200–300 m] wide, covered with dense vegetation, consisting mostly of coconut palms. This belt surrounds the island's center, a sort of dome-shaped plateau less than 150 ft [50 m] high, made up of phosphatic deposits.

The hot, humid climate (with average annual temperatures of about 81–82°F [27–28°C]) favors lush equatorial vegetation (coconut palms, bananas, mangoes, papayas, etc.) along the coast.

Population. Fewer than 10,000 people live on the island,

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which has an area of just over 8 mi² [21.2 km²], resulting in a very high average density of 1142 inhabitants per mi² [441 per km²]. Over 60% of the population is indigenous (with characteristics that are a blend between Melanesian and Polynesian types), while the remainder is predominantly of Chinese or European background. The population is concentrated in small settlements located for the most part along the coastal strip. The most important of these is Yaren, the country's capital and main port. The most widely used languages are English and the local dialect (Nauruan); most inhabitants are Protestant.

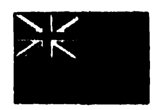
Economic summary. The principal and almost exclusive economic activity of Nauru is the mining of the extremely rich tricalcium phosphate deposits that cover most of the island. Treated with dilute sulfuric acid, this material is transformed into monocalcium phosphate, commercially known as superphosphate, an extremely valuable fertilizer, of which Nauru is one of the world's foremost producers (almost 1.87 million t in 1987). The fertilizer is regularly exported to Australia, New Zealand, Japan, and South Korea. Nationalization of the deposits in 1970 represented a significant step toward this small state's independence, in both political and economic terms. On the other hand, this extreme product specialization is tied to a single, exhaustible resource (predicted to be depleted by the end of the century), and this poses a series of problems in terms of the unavoidable connection to the international market and the future of the country's economy. The development of transportation facilities (roads, port, and airport), the utilization of local crops and fish, and a series of medium and long-term projects (such as the possible transformation of the island into a "tax haven") are some of the solutions already being implemented or under consideration, to create and guarantee new sources of income for Nauru's dense population.

Historical profile. Discovered in 1798 by the English navigator John Hunter, who named it "Pleasant," the island was annexed by Germany in 1888. During World War I it was occupied by Australian troops. At the end of the conflict the League of Nations entrusted its joint mandate to Australia, New Zealand, and Great Britain, an arrangement that was renewed in 1947, after three years of oppressive Japanese occupation during World War II. An attempt by Australia to annex the island in 1964 led the inhabitants to push for independence, which they obtained in 1968.

Socioeconomic data

Income (per capita, US$)	20,000 (1989)
Population growth rate (% per year)	1.6 (1983–89)
Birth rate (annual, per 1,000 pop.)	21 (1989)
Mortality rate (annual, per 1,000 pop.)	5 (1989)
Life expectancy at birth (years)	55.5 (1987)
Urban population (% of total)	–
Economically active population (% of total)	–
Illiteracy (% of total population)	5 (1979)
Available nutrition (daily calories per capita)	–
Energy consumption (10^6 tons coal equivalent)	59 (1987)

NEW ZEALAND



Geopolitical summary

Official name	Dominion of New Zealand
Area	104,426 mi² [270,534 km²] (excluding overseas and Antarctic territories)
Population	3,427,796 (1991 census)
Form of government	Independent country within the Commonwealth. The head of state is the British monarch, represented by the governor. Legislative power is exercised by the House of Representatives, elected every 3 years. The prime minister presides over the Executive Council.
Administrative structure	14 regional councils (9 on the North Island, 5 on the South Island)
Capital	Wellington (pop. 149,598, 1991 census)
International relations	Member of UN, Commonwealth, SPC, Colombo Plan, and ANZUS
Official language	English
Religion	Predominantly Protestant; Catholics 15%
Currency	New Zealand dollar

Natural environment. New Zealand, located approximately 1240 mi [2000 km] southeast of Australia, is bordered on the east by the Pacific Ocean and on the west by the Tasman Sea.

Geological structure and relief. The two large islands that make up New Zealand (North Island and South Island), along with the smaller Stewart, D'Urville, and Great Barrier islands, rise above an extended but shallow underwater platform. The ridges that are connected to this broad shelf form, in addition to New Zealand, other oceanic archipelagoes, such as Tonga and

New Caledonia. The arrangement of these underwater ridges determines New Zealand's striking orographic system, with parallel mountain chains running the entire length of the two major islands.

On the South Island, where elevations often exceed 10,000 ft [3000 m] (Mt. Cook, 12,346 ft [3764 m] high, is the country's highest peak), the principal mountains are the Southern Alps. A series of ridges branch off from these, descending toward the southeast into lesser hilly rises, and progressing steadily toward the southwest as far as the coast, where they form highly articulated fjords.

On the North Island the Tararua, Ruahine, Huiarau, and Raukumara ranges run in the same southeast–northwest direction as the Southern Alps, but without reaching the same elevations; these mountains border the eastern edge of a large central plateau, the western border of which is defined by the Hauhangaroa Mountains. At their northern extremity they taper into the hills of the Auckland peninsula, a long strip of land formed by the seeping of ocean waters into the alluvial basins, a phenomenon that causes an extremely fragmented coastline with a wealth of deep inlets.

From a geological viewpoint New Zealand is characterized by the presence of sedimentary and metamorphic rocks from every era, from the Precambrian (limited to certain areas of South Island) through the Cenozoic, and particularly from the Tertiary period. The Pliocene epoch was especially dynamic; on the South Island the ranges of the Southern Alps rose to heights well above their current elevation, while the North Island was reshaped by intense eruptive activity. On the North Island the mountains in the north–central area and the isolated Mt. Egmont have recent volcanic origins (indeed, the Maori call this land the "Smoking Island"). There are still frequent secondary volcanic phenomena, such as geysers, solfataras, and thermal springs, such as those in Waimangu as described here by Mary Ann Harrell:

> *Near Rotorua the Waimangu Valley holds one of the newest geothermal areas in the world.... I toured it one day in the company of geologist Brad Scott and Averill Adlam of the District Council.... Brad talked proudly of the valley: "New Zealand's only undisturbed thermal area- no dams, no boreholes—and one of the best documented."...*
>
> *"Before 1950 New Zealand had about 130 geysers," said Averill Adlam; "now there're fewer than 10. In the '50s the government decided to generate electricity at Wairakei. Vast quantities of geothermal heat have been drawn off there, and we've lost 30 geysers at Wairakei and 3 at Lake Taupo. They dammed the Waikato River in the '60s and we lost 90." Rotoruans drilled private boreholes for swimming pools and spas, some 800 wells by the '80s, and, Averill added, the town's geysers "started to stop."...*
>
> *"We shouldn't have to go to Yellowstone Park to see a geyser!" Averill declared, as we went out to Whakarewarewa, the thermal area in a Maori community. We waited to see if Pohutu, grandest of them all, would perform. Pohutu muttered and rumbled and sent a giant white plume roaring up into white and chilly mist.*

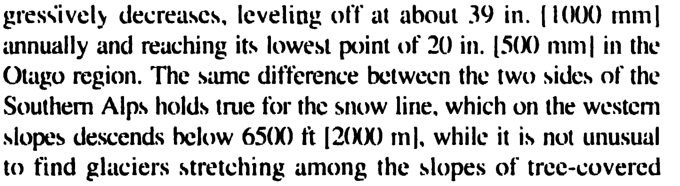
Hydrography. On the South Island the longitudinal arrangement of the mountains within a long narrow territory has resulted in short, rapidly flowing rivers, abundantly supplied by numerous glaciers and snowfields. Along the eastern slopes of the Southern Alps, numerous rivers flow in parallel descents: the Waiau, Rakaia, Waimakariri, Waitaki, and Clutha flow from north to south, in some cases fed by large, elongated lakes of glacial origin that lie at the foot of the mountain ranges.

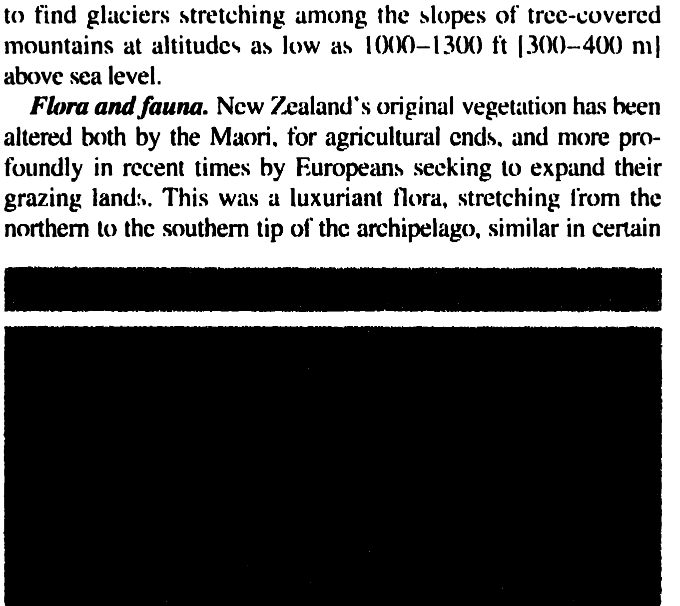
The North Island has different hydrographic features. Some of the rivers there flow through the central plateau and are longer and more regular. The most important of these is the Waikato, which begins in the plateau, flows into Lake Taupo (volcanic in origin and the country's largest lake, 234 mi^2 [606 km^2]), and after a course of over 200 mi [350 km], part of which is navigable, it empties into the Tasman Sea, not far from Auckland.

Climate. In general New Zealand has a temperate oceanic climate, with moderate seasonal fluctuations and a tendency to mild temperatures. In Auckland, for example, from January to July the average monthly temperature drops from 66°F [18.6°C] to 50°F [10.2°C], while in a southern location such as Dunedin the variation within the same time span ranges from 57°F [14.1°C] to 43°F [6.2°C]. The westerlies, or west winds, that blow continually throughout the year south of 39° latitude, the arrangement of the mountains, and the effect of the ocean act to mitigate seasonal fluctuations in climate. The country's extensive north–south range, however, does mean differences in climate, from subtropical at its northern extremity (making it possible to grow grapes and citrus on the Auckland peninsula) to severe and continental in the southern regions.

Precipitation is abundant and constant throughout the year, but distributed most uniformly on the North Island, where the mountains are less accentuated and dense. On the South Island the barrier constituted by the mountains of the Southern Alps is characterized by high amounts of rainfall, particularly on the western slopes (about 200 in. [5000 mm] annually above elevations of 6500 ft [2000 m]). In contrast, rainfall on the eastern slopes progressively decreases, leveling off at about 39 in. [1000 mm] annually and reaching its lowest point of 20 in. [500 mm] in the Otago region. The same difference between the two sides of the Southern Alps holds true for the snow line, which on the western slopes descends below 6500 ft [2000 m], while it is not unusual to find glaciers stretching among the slopes of tree-covered mountains at altitudes as low as 1000–1300 ft [300–400 m] above sea level.

Flora and fauna. New Zealand's original vegetation has been altered both by the Maori, for agricultural ends, and more profoundly in recent times by Europeans seeking to expand their grazing lands. This was a luxuriant flora, stretching from the northern to the southern tip of the archipelago, similar in certain





aspects to the vegetation of South America as well as that of Australia. Today this original flora can still be seen on the western mountain slopes, which are covered by a dense mantle of palms, tree ferns, lianas, and conifers (*Podocarpus*, *Dacrydium*, *Phyllocladus*, etc.).

While the surviving forests have an almost total absence of indigenous mammals, there is rich birdlife, including certain types like the kiwi (a nocturnal, wingless bird), the boobook (or mopoke, a small owl with spotted plumage), the weka (with habits similar to the thieving magpie), and kea and kakapo parrots. After the arrival of the Europeans the moa, a large, flightless bird resembling an ostrich that could grow up to 13 ft [4 m] tall, became completely extinct and is now known only through skeletons and reproductions in various museums. The takahe (wingless like the kiwi) was also considered extinct until 1948, when a colony of the birds was discovered near Mt. Murchison.

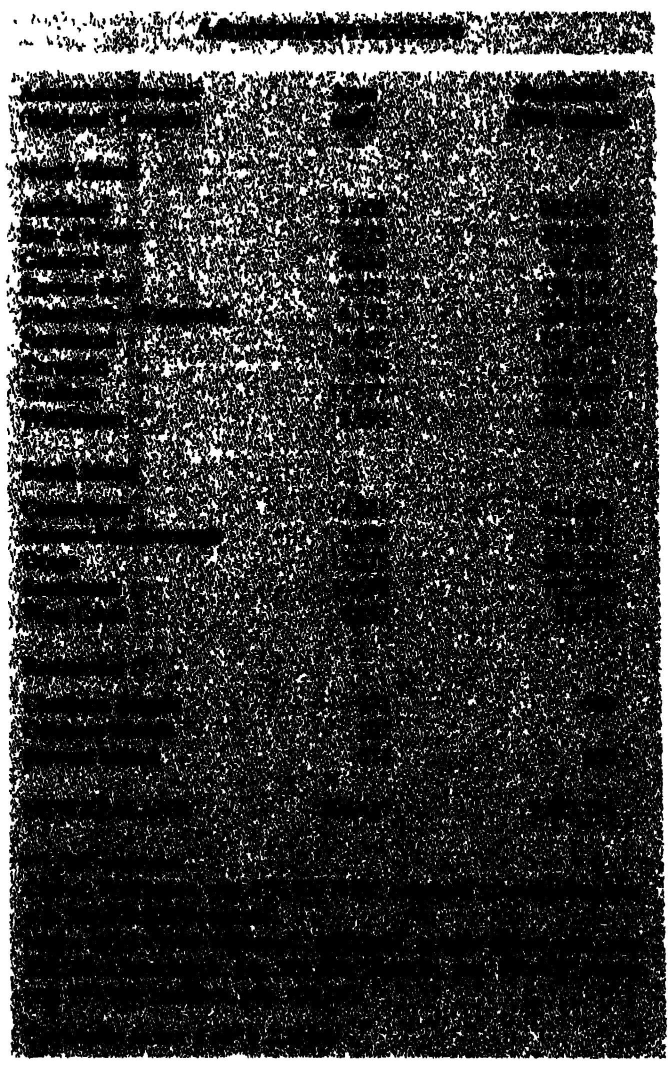
Today the flora and fauna of New Zealand are protected within numerous reserves and national parks, about ten of which are on the North Island and an equal number on the South Island. The most extensive park on the South Island is Fiordland National Park.

Population. New Zealand's population has long been characterized by conflict between the Maori, who have occupied the archipelago (mainly the North Island) since the 10th century, and the Europeans, who repeatedly attempted to take possession of the islands from the 17th to the early 19th century. At the time of Captain James Cook's voyages there were approximately 250,000 Maoris, but their numbers were so decimated by epidemics and wars with the Europeans that by the end of the 19th century their population had been reduced to 42,000, and extinction threatened. However, a high birth rate raised their population above precolonial levels, and they currently number approximately 300,000.

The present-day population of New Zealand is approximately 3.4 million, the great majority of whom are of European background, particularly of English, Scottish, and Irish descent, and still tied in outlook and culture to their forebears' native lands. The official language is English, and the Protestant faith is the most widespread religion (15% of the population is Catholic and there is also a small number of Jews). The European population did not arrive at a constant rate, nor were there any massive influxes of immigrants. The migratory waves of the 19th century, particularly strong during the gold rush of the 1860s, were impeded by restrictive immigration policies that dated back to the turn of the century. Thus the population increased according to natural growth, favored by rather advanced, "Scandinavian-type" social legislation and by a high standard of living.

The low demographic density of New Zealand is due to the country's settlement history and to a deliberately limited immigration policy. The population density is rather unbalanced between the North Island (where the average density reaches 57 inhabitants per mi^2 [22 per km^2]) and the South Island (16 inhabitants per mi^2 [6 per km^2]). In the former, which is favored by a gentler climate and more accessible terrain, the population is concentrated around Auckland and Wellington. These two cities, which have respectively 850,900 and 324,600 inhabitants, account for almost half the island's population, which gravitates around the industrial and commercial activities tied to the two important ports. The rest of the population lives either in the coastal cities (such as Napier and New Plymouth) or in centers in the interior (such as Palmerston North and Hamilton). Given the presence of vast arable areas, however, a large percentage of the population also resides in rural villages and on isolated farms scattered throughout the most fertile regions. The same settlement patterns can be seen on the South Island, but somewhat simplified. There is a contrast between the coastal cities and the small centers that dot the arable regions. There are only two important urban centers, Christchurch, with 301,500 inhabitants, and Dunedin, with a population of 106,400. The smaller centers do not extend beyond the eastern coastal plains, while the country's interior remains for the most part uninhabited; rough terrain makes the Southern Alps region and its entire western slope particularly inhospitable.

In recent years the growth of the cities on both the North and South Islands has led to problems of poverty and marginalization typical of urban areas everywhere, and it has been the Maori who above all have paid the price. But while international economic difficulties have had repercussions in New Zealand, tarnishing the image of a society without tensions, these problems are mitigated by social welfare measures provided by legislation that is among the most advanced in the world.



Economic summary. Despite considerable progress in the diversification of productive activities, particularly in recent years, the basis of the New Zealand economy still lies in the agricultural and sheepherding sectors. This activity dates back to the time of British colonization, when vast wooded areas were transformed into permanent pastures and grazing lands, and the raising of Merino sheep was introduced on a large scale. Currently almost 51% of the entire land area is permanent meadows and pastureland, 27% is occupied by forests, and approximately 2% is set aside for farming and tree cultivation; the remainder of the land is uncultivated and unproductive.

This basic economic picture, which until the 1970s seemed to guarantee the country's continual progress, was somewhat undermined in recent decades by changes that occurred on the international political and economic scene. Primarily, Great Britain's entry into the EC and the limitations placed by the latter on certain imports from "outside countries" have led to a reduction of traditional commercial outlets for New Zealand, which until the 1950s channeled over 50% of its exports toward the former mother country. At the same time, and parallel to the global energy crisis and the stagnation of international prices for raw materials and basic food products, there was an increased need to import industrial and consumer goods as well as tools, indispensable for meeting domestic demand and for the technological development of local manufacturing activity. This created an essentially subordinate relationship with the principal industrialized nations, particularly Japan and the United States, although New Zealand has still managed to maintain a well-balanced economy, reflected in the rather modest unemployment rate (just over 7%), a per-capita income of US$13,200 (1990), and a generally low foreign debt (estimated in 1989 at US$19 billion). In contrast, GNP growth has been rather inconsistent, with a favorable period (1983–86) followed by a decline in more recent years.

Agriculture and livestock. Agriculture and animal husbandry represent the country's most significant economic sectors, both contributing directly to GNP (approximately 9%) and supplying the country's traditional industrial activities (processing of meat and dairy products, wool, and leather).

There are a large number of mid-sized farms (about 75–100 acres [30–40 ha]), well organized and often family-run, which, in addition to managing the country's rich livestock holdings, produce wheat (242,000 t in 1990), barley (508,200 t), oats, corn, potatoes, and tomatoes, destined for the most part for local consumption, as well as fruits and vegetables (strawberries, raspberries, apples, grapes, and pears), most of which are exported. There is industrial farming of tobacco (1100 t in 1990) and New Zealand flax (*Phormium tenax*), from which a rather resistant textile fiber, similar to hemp, is made, and of which New Zealand is the largest producer in the world.

The country's principal economic resource is still livestock, with holdings consisting of some 57 million head of sheep and approximately 8.2 million head of cattle (1991), as well as a smaller number of pigs, goats, and horses. While the intensive raising of Merino sheep dates back to colonial times and is practiced on both North and South Islands (slightly more predominantly on the latter), cattle-raising was introduced more recently and for the most part benefits from the grazing lands on North Island. Livestock products, including meat, wool, dairy products, and hides, constitute the principal source of the country's monetary earnings.

The forests yield precious woods (over 353 million ft^3 [10 million m^3] of logs and milled lumber were produced in 1989) and also provide chemical or mechanical pulp (over 1.1 million t) for paper and cardboard production.

Mining resources and industry. New Zealand is not particularly rich in major mineral resources, with the sole exception of coal and lignite (found in various mines located along the coasts of both islands, from which almost 2.9 million t were extracted in 1989), and, to a lesser extent, gold, silver, iron, and copper. Oil and gas reserves have also been discovered in Motorua, Maui, Taranaki, and Kotuku, which in 1989 yielded altogether approximately 10.7 million bbl [1,697,000 metric t] of crude oil and over 214,271 ft^3 [6070 m^3] of gas.

The dense hydrographic network, with rapid rivers often fed by permanent snowfields, has favored the construction of numerous hydroelectric power stations (supplemented by geothermal plants fed by the Wairakei geysers) and provides the country with an energy output (total of 6,964,000 kW of installed power in 1989) that, at the current rate of production (approximately 29 billion kWh in 1989), supplies more than 75% of domestic needs. Other thermoelectric plants are located in New Plymouth, Marsden, Meremere, Stratford, and Whirinaki.

New Zealand industry (which overall contributes approximately 21% to GNP) is traditionally based on a network of cooperatives that brings together small and medium-sized enterprises dedicated above all to activities connected to livestock raising (the processing of meat and hides, the dairy industry, and textile manufacturing).

Since World War II, and particularly in order to meet domestic demands, other industrial activities have been developed in the areas of food processing, clothing and shoe production, furniture and appliance manufacturing, construction materials, fertilizers, and paper and tobacco production. Automobile assembly plants have been built (360,912 cars and 23,179 commercial vehicles were produced in 1990, mainly at the plants in Auckland and Christchurch). New Zealand's industrial sector (like that of nearby Australia) has perceived the need to adequately confront the increasingly aggressive nature of foreign trade (particularly that of Japan and other newly industrialized nations of southeast Asia, expressed for the most part in the supply of high technology products). As a result, considerable resources are being allocated to the development of its own advanced industry, particularly in the electrical and electronics, petrochemical, agro-

Socioeconomic data

Income (per capita, US$)	13,200 (1990)
Population growth rate (% per year)	0.7 (1980–89)
Birth rate (annual, per 1,000 pop.)	16 (1989)
Mortality rate (annual, per 1,000 pop.)	8 (1989)
Life expectancy at birth (years)	75 (1989)
Urban population (% of total)	84.1 (1989)
Economically active population (% of total)	44.3 (1988)
Illiteracy (% of total population)	1 (1991)
Available nutrition (daily calories per capita)	3,393 (1989)
Energy consumption (10^6 tons coal equivalent)	12.7 (1987)

industrial, and tourism sectors, which best take advantage of local resources and diversify manufacturing activities.

Commerce and communications. The relative instability of the New Zealand economy is reflected in the development of foreign trade, where the tendency for exports to exceed imports that characterized the country's trade balance until 1973 has given way to the opposite trend, with a 1983 trade deficit equal to US$652 million. However, subsequent years have seen a tendency to restore the trade balance, along with a greater diversification of trading partners.

While continuing to maintain special relationships with the Commonwealth nations, in particular with Australia, New Zealand has considerably expanded the number of foreign countries that serve as both suppliers and customers (there are currently more than 100 markets for the country's traditional products), implementing a trade strategy that favors the importation of goods or services (particularly innovative technologies) from those markets that show interest in buying New Zealand products.

The highway network is particularly good, considering the rough terrain; almost 58,000 mi [93,000 km] of roads, of which over 31,000 mi [51,000 km] are paved, ensures the circulation of goods and people within the country. There is a modest railroad network (approximately 2700 mi [4300 km]), with the principal lines connecting Auckland to Wellington in the north and Christchurch to Dunedin in the south, and excellent air service, with the chief airports in Auckland, Christchurch and Wellington. The merchant marine had 135 ships in 1990, with a gross register tonnage of just under 300,000 t; the principal ports are Auckland, Wellington, and Lyttelton (Christchurch).

Historical and cultural profile. From the 10th to 14th centuries successive waves of peoples came from the eastern part of Polynesia to the two large islands that make up present-day New Zealand. Later known as the Maori, these groups arrived in long canoe-like boats, the legendary names of which (such as Arawa, Aotea, Matatua, and Horouta) remained to designate the various tribes, which, in the absence of a unifying organization, constituted these people's fundamental social structure. Archeological research has revealed that the oldest traces of human life in New Zealand, found in the mountainous regions, date back only to the mid-12th century. Folco Quilici has written in his book about the region:

> *It is a boast for the Maori to cite descent from the Polynesian colonists who arrived in New Zealand ... on the first double canoes, the names of which are still remembered and venerated.*
>
> *Look at Tainui, Te Arawa, Mataatua, Kurahaupo, and Tokomaru*
> *They all float on the vast oceanic descent*
> *The tree trunk was carved in Hawaiki,*
> *And thus Takitumu took shape.*
> *One night was spent in Rangipo*
> *And Atea took to the sea at dawn.*
> *These are the canoes of Uenuku*
> *The fame of which reaches the heavens.*
>
> *Apropos of these earliest voyages of the Great Emigration from Tahiti toward New Zealand, Polynesian oral tradition tells us that:*
>
> *The canoe Tainui under the command of Hoturoa was prepared to leave Hawaiki on the night called Orongo (the twenty-seventh) of the lunar month of October-November. The elders advised Hoturoa to delay his departure until the stormy Tamatea (the nights from the sixth to the ninth) of the following month had passed, but Hoturoa responded: "I want to depart now and meet the Tamatea on the open sea." And, overcoming storms and dangers, he reached Cape Runaway safe and sound.*
>
> *There is a widely held belief among scholars of the transmigrations that the Polynesians pushed on as far as the subantarctic seas. In fact, according to Rarotonga mythology, the tales of the exploits of the distant ancestors include the story of a voyage to the extreme south by a canoe leader called Ui-te-rangiora.*
>
> *He lived in the early part of the 18th century and with his boat Teivi-o-Atea set sail toward the distant south, where he saw the cliffs that rise out of the sea called Tai-rua-koko, long hair floating on the surface of the waters, the sea covered with arrowroot foam, animals that dove into the depths of the sea, a dark place where the sun could not be seen, with high white cliffs devoid of any vegetation.*
>
> *All these marvels have been interpreted respectively as the sea south of Rapa, dark algae, the frozen sea, sea lions, the Antarctic night, and icebergs. And this information offers proof of the extreme frontier toward the Atlantic reached by the Polynesian fishing canoes.*

Gradually adapting to their new environment and engaging primarily in fishing, the Maori also proved themselves to be highly original in their artistic pursuits, making freestanding and bas-relief figures carved out of wood, which they used to decorate the prows and sterns of war canoes, and later, community buildings. Unlike the Australian Aborigines, the Maori strongly resisted European expeditions that attempted to take possession of the two islands. In 1642 they pushed back Abel Tasman, who called the islands "Staatenland" (Land of States); later the region was named New Zealand, after a Dutch province. The British explorer James Cook and the Frenchmen Dufresne and de Surville were repelled 130 years later, and the fame of the Maori's ferocity kept Europeans at bay until the early 19th century.

Only the fear of being preceded by France, during a period when the islands of Oceania were being divided up by the colonial powers, prompted Great Britain to intensify its attempts at conquest. To this end the New Zealand Land Company was established, the founder of which, Edward Gibbon Wakefield, managed to impose English sovereignty over the Maori chiefs in exchange for the protection of their ancestral lands (Treaty of Waitangi, 1840). Then "systematic colonization" began, as theorized by Wakefield, with an influx of pioneers, the spread of sheep farming, and the appropriation of the most fertile lands at the expense of the indigenous peoples, whose response was not long in coming. In 1845–48 and again in 1860–69 the Maori waged extremely bloody wars against the European settlers, but they emerged defeated and decimated, and by 1872 their "pacification" could be said to be complete.

Having overcome the sole obstacle to the colonial exploitation of the two islands, rapid economic development ensued, intensified by the discovery of gold and also, in the last quarter of the 19th century, by progress in the refrigeration industry, which allowed livestock raising to be oriented not only to the production of wool, but also to a massive production of meat for export.

Economic development was accompanied by continual polit-

ical and social progress. In 1907 Great Britain granted dominion status and administrative autonomy to the islands. Institutions became more democratic (with voting rights extended to women in 1893), and advanced social legislation protected workers' rights. This process of renewal, particularly evident during the Liberal era under the government of Richard Seddon (1893–1906), also influenced intellectual circles, which abandoned the reproduction of Anglo-Saxon models to courageously confront social issues.

After an early pioneering phase, there was a period of greater realistic interest in the lives of the Maori, seen in Alfred A. Grace's *Tales of a Dying Race* (1901) and other novels and in the works of Harry B. Vogel and Herbert Guthrie-Smith.

Although their work is uneven, the writings of Jessie Mackay, William Pember Reeves, and the feminist Edith Searle Grossmann do bear witness to the fervor that animated the New Zealand world of the early 20th century. The most well known voice of New Zealand literature is that of Katherine Mansfield, a writer who was torn between the European world where she settled and loyalty to the almost mythic image of her native land. While this is a theme not directly tied to the "engaged" themes of so many other New Zealand writers of the time, her work is equally symptomatic of that atmosphere.

The period between the two World Wars was also important for New Zealand's development in terms of material progress, such as the nationalization plan pursued in various productive sectors by Labour Party Prime Minister Michael Joseph Savage; cultural accomplishments, seen in the flourishing of important literary magazines (*Phoenix, Landfall, New Zealand Poetry Book*); and renewed interest in studies of the local ethnic heritage. Thanks to this uninterrupted development, in the past fifty years New Zealand has been able to emerge as a significant power in the Pacific, moving away from the exclusive influence of Great Britain and building relationships with Australia and the United States, establishing diplomatic relations with The People's Republic of China (1972), and, finally, protesting against nuclear testing carried out by France in the Pacific Ocean.

Political power has alternated between the conservative National Party and the Labour Party, with the latter winning the elections of 1984 and 1987, and the former taking over after the elections of 1990.

PAPUA NEW GUINEA

Geopolitical summary

Official name	Independent State of Papua New Guinea
Area	178,656 mi^2 [462,840 km^2]
Population	3,689,038 (1990 census)
Form of government	Independent state within the Commonwealth. The head of state is the British sovereign, represented by a governor-general. The National Parliament is elected by universal suffrage every 4 years.
Administrative structure	20 provinces
Capital	Port Moresby (pop. 152,100; 1989 estimate)
International relations	Member of the UN, the Commonwealth, and SPF (South Pacific Forum)
Official language	English; Papuan and Melanesian languages are widespread.
Religion	Protestant, 58%; Catholic, 34%; remainder animist.
Currency	Kina

Natural environment. The island of New Guinea is subdivided into two political units separated by a border that runs along longitude 141° E of Greenwich. Irian Jaya, which is part of Indonesia, lies to the west of this line and the autonomous state of Papua New Guinea lies east of it. An independent entity within the British Commonwealth since 1975, Papua New Guinea also includes the Bismarck Archipelago (the largest islands of which are New Britain and New Ireland), the northwestern section of the Solomon Islands (including the islands of Bougainville and Buka), as well as the smaller archipelagoes of Louisiade and D'Entrecasteaux and the Trobriand (Kiriwina) Islands.

New Guinea is traversed longitudinally by an impressive mountain system that clearly divides the island into two parts. It

is made up of various sections the highest of which consists of the Maoke Mountains in Irian Jaya (Puncak Jaya 16 500 ft [5030 m] is the island's highest peak) Papua New Guinea contains the Central Range the Bismarck Mountains and the Owen Stanley Range the peaks of which exceed 13 000 ft [4000 m] These mountain chains are Tertiary in origin and are made up of calcareous formations the base includes schists gneiss and other ancient rocks with striking granite intrusions Both the Owen Stanley Range and the northern ranges have notable volcanic formations some of which are still active (volcanic activity also characterizes the archipelagoes and the smaller islands) North of the mountain chains is an interior depression beyond which a lesser mountainous strip rises parallel to the northern coast The island's large southern plains extend south of the central mountains with marshy stretches furrowed by long water courses that flow toward the Coral Sea

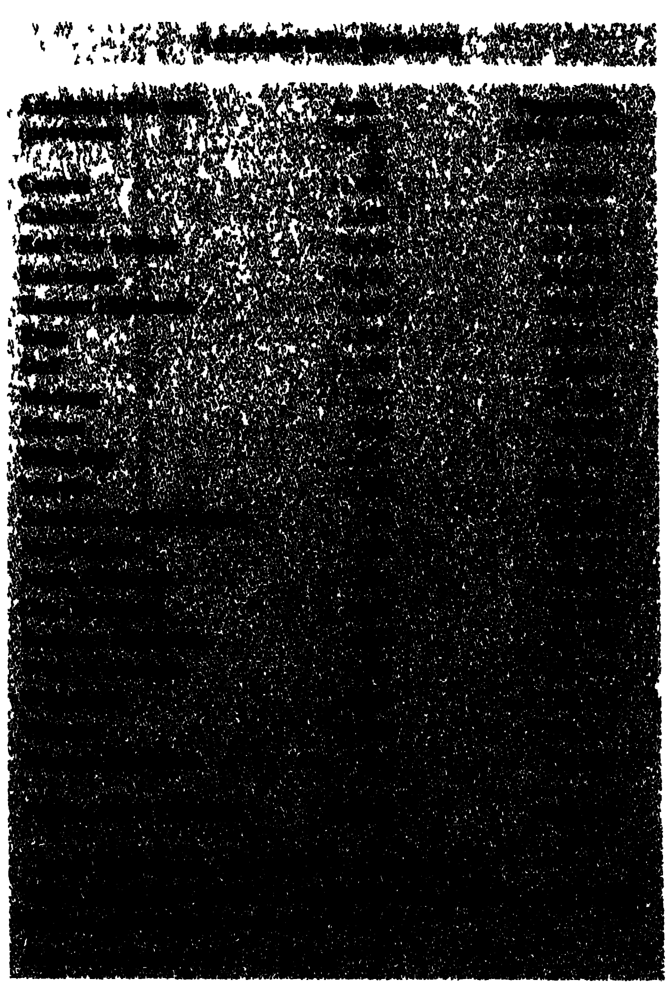
Due to the morphology of the land and the abundant and almost constant precipitation the region hydrography is rich and complex The principal river is the Fly (682 mi [1100 km] long) which flows past the island's southern slopes and is navigable for approximately 434 mi [700 km] Along with the Kikori and the Purari it has formed extremely vast alluvial deposits The three rivers flow into the Gulf of Papua in a series of estuaries The Sepik navigable for 310 mi [500 km] and the Ramu empty into the Bismarck Sea

The climate is equatorial with slight seasonal fluctuations in temperature and with abundant precipitation Temperatures vary with altitude the average temperature at sea level is about 82 F [28 C] while at elevations of 6500 ft [2000 m] it is approximately 61°F [16 C] Rainfall is distributed throughout the year from May to November it is carried by the monsoons from the southeast from December to April by the northeasterly trade winds Precipitation is particularly abundant (117 195 in [3000 5000 mm] annually) in the central part of the island lighter in the southeastern region

The vegetation is extremely varied and diversified Along the coasts there is a dense mangrove covering up to approximately 5000 ft [1500 m] the rainforest predominates in three layers (undergrowth high trunk trees epiphytes or air plants) between about 5000 and 10 000 ft [1500–3000 m] there is mountainous equatorial forest with oaks and southern beech and without any air plants Above 10 000 ft [3000 m] there is conifer forest which ultimately gives way to mountain grasslands In this type of environment the birdlife is particularly rich (birds of paradise parrots etc) Wild boar are one of the more common mammals and the so called black tree kangaroo' one of the region's marsupials

Population. There are still some pygmoid groups living on the island in a few interior mountain regions These were probably the region's most ancient inhabitants who were then joined by various other elements Today 95% of the population is made up of Papuan and Melanesian groups, the former who have elongated skulls and woolly hair (characteristics similar to the Australian aborigines) live predominantly in the interior and in the mountains divided into hundreds of tribes (such as the Daudai the Goigala and the Kukukuku) The Melanesians, who have mesocephalic skulls and curly hair predominate along the coasts and on the smaller islands (tribes such as the Tolai, the Motu and the Suau are generally skilled at navigation and fishing) The approximately 50 000 nonindigenous people are of European or Asian origin and arrived during the 20th century The native populations practice animist religions and speak over 700 local tongues English Tok Pisin (a Melanesian pidgin), and Hiri Motu are the official languages

In 1990 the population of Papua New Guinea was about 3 7 million with a density of approximately 20 inhabitants per mi² [7 7 per km²] Demographic growth traditionally slow due to endemic diseases and tribal warfare has lately experienced a sharp increase particularly in the recently urbanized coastal areas From 1981 89 the annual growth rate was about 2 5% The most populated regions are those along the northeastern coast (where the Ramu and Sepik plains are located) and some mountain areas where the climate is mitigated by the altitude (generally settlements do not occur at elevations above 6500 ft [2000 m]) The phenomenon of urbanization which dates back



only to the last twenty years, has taken place for the most part in the coastal areas, where some cities have developed, generally port centers that function as markets. There is still no real network of cities; the urban population represents about 16% of the total, and settlements with over 10,000 inhabitants are very rare. The country's major center is the capital, Port Moresby, founded in 1873 by the British. It is an active port, located on the Gulf of Papua facing the Coral Sea, in a position favorable to traffic with Australia. Lae and Madang are located on the northern coasts, while the main city in the Bismarck Archipelago is Rabaul on the island of New Britain.

Economic summary. Papua New Guinea's economy is still largely based on traditional forms of land utilization. Over two thirds of the economically active population is engaged in agriculture, which is organized according to rudimentary agrarian methods and is geared for family consumption. Nonetheless, with foreign financial assistance and investments (in particular from Australia, but also from Japan and the U.S.), the authorities are seeking to institute reforms and economic innovations. The wealth of some basic agrarian, forest, mineral, and hydroelectric resources supports prospects for future positive developments that will make it possible to lessen the large foreign debt contracted on international markets and begin on a path toward economic independence. In any case, despite difficulties connected to the necessity for foreign aid and to the close dependency on the international situation, the government's economic policy has allowed the country to achieve a satisfactory average living standard, higher than that of many developing countries.

Farmland and orchards occupy less than 1% of the country's area, woodlands and forests almost 83%. The remainder of the land is uncultivated and unproductive. The traditional mountain economy is based on the production of sweet potatoes, generally cultivated in an itinerant pattern. When the fertility of the soil in a given area is depleted, that area is abandoned and new land, often obtained and fertilized by burning the existing vegetation, is found to cultivate. Within this subsistence economy, peanuts, taro, and corn are also grown and pigs are raised. In the plains that extend along the coasts at the foot of the mountains, the traditional dietary staple is breadfruit; taro, bananas, yams, and bitter cassava are also cultivated. Attempts to modernize the agricultural sector have been based on the plantation system, now decreasingly controlled by foreign owners and managed by local entrepreneurs. The principal cash crops are cocoa (the country's primary agricultural export), coffee, tea, rubber, and coconut palm (which allows the export of a fair amount of copra). The forest resources are enormous, with numerous highly valued species of wood (Guinean pine is well known); in 1989 almost 300 million ft^3 [8.23 million m^3] of timber were cut. There has been a notable increase in fishing, the catch being not only destined for local markets, but also exported (in this regard the harvesting of mother-of-pearl, conch, and tortoise are significant).

Mineral resources are particularly abundant, but have been only partially identified and barely exploited. Copper production is considerable (over 187,000 t in 1990), particularly on the island of Bougainville; prospecting and recent research have ascertained the presence of rich deposits of gold (already partially utilized), platinum, silver, nickel, iron, lead, and oil. Water resources are also plentiful, ensured by the presence of numerous abundant, steep-coursed rivers interrupted by waterfalls. Despite this potential, manufacturing is barely in evidence and is limited fundamentally to the processing of agricultural and forestry products.

Trade is based on the importation of foodstuffs, industrial goods, and fuels and on the exportation of copper, copra, coffee, and cocoa. The principal trading partners are Australia, Japan, the U.S., Germany, and Great Britain. For the development of economic activities and an efficient urban network it would be necessary to create an adequate transportation and communications system, a situation that is hardly favored by the region's morphology. There are no railroads, and in 1980 the highway network consisted of about 12,400 mi [20,000 km] of roads, only some of which are paved. Sea and river communications, however, are fairly well organized, and air transportation is increasing. Tourism is only in its initial stages, but there is interesting potential for "adventure trips."

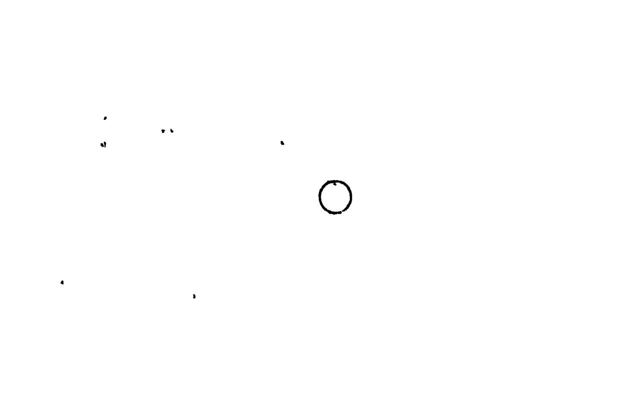
Socioeconomic data

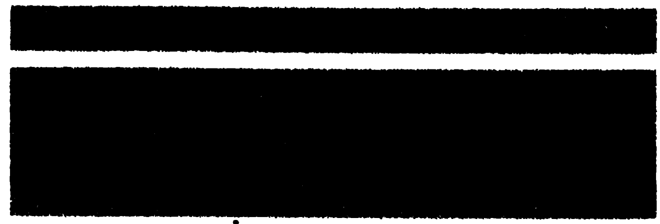
Income (per capita, US$)	900 (1990)
Population growth rate (% per year)	2.5 (1980–89)
Birth rate (annual, per 1,000 pop.)	36 (1989)
Mortality rate (annual, per 1,000 pop.)	11 (1989)
Life expectancy at birth (years)	54 (1989)
Urban population (% of total)	16 (1989)
Economically active population (% of total)	46.8 (1988)
Illiteracy (% of total population)	57.7 (1991)
Available nutrition (daily calories per capita)	2,236 (1991)
Energy consumption (10^6 tons coal equivalent)	1,154 (1987)

Historical and cultural profile. Populated by early Australoid peoples, who some 40,000 years ago had probably already pushed out from Asia toward the Australian continent, New Guinea long remained unknown to Europeans. The region was a mosaic of small Papuan and Melanesian communities, with varied expressions of local culture and arts based on magic and religion. Spain took possession in purely formal fashion in 1528 and called the area New Guinea, convinced of a similarity between the native peoples and the Africans of the Gulf of Guinea. True colonization occurred over the course of the 19th century, with the partition of the island among the Dutch (who in the early decades of that century, had settled the western part of the island and claimed it as a possession in 1885), the Germans (the protectorate of Kaiser-Wilhelmsland, established in 1884 in the northeastern region), and the British (the protectorate of Papua, to the southeast). After World War I the two eastern protectorates came under Australian rule, and during World War II the island constituted an important strategic base for the Allies.

After World War II the island was definitively divided between the former Dutch zone, entrusted by the UN to administration by Indonesia (to which it became integrally connected in 1969, when it became known as Irian Jaya), and the eastern zone, which went from being an Australian mandate to autonomous rule in 1973 and independence in 1975. The island of Bougainville, the country's most economically advanced region, has manifested separatist tendencies.

SOLOMON ISLANDS





Geopolitical summary

Official name	Solomon Islands
Area	10,637 mi² [27,556 km²]
Population	285,796 (1986 census); 318,707 (1990 estimate)
Form of government	Independent state within the Commonwealth. The head of state is the British sovereign, represented by a governor-general. The National Parliament is elected by universal suffrage every 4 years.
Administrative structure	7 provinces and the capital territory
Capital	Honiara (pop. 35,288; 1990 census)
International relations	Member of UN, Commonwealth, and SPF (South Pacific Forum)
Official language	English; Melanesian and Polynesian languages widespread.
Religion	Predominantly Protestant; Catholic (17%)
Currency	Solomon Islands dollar

Natural environment. The Solomon Islands, located in Melanesia in the Pacific Ocean, are made up of two island groups separated by a deep stretch of ocean: Choiseul, Santa Isabel, and New Georgia to the northwest, and Malaita, Guadalcanal, and San Cristobal to the southeast. Other islands and minor archipelagoes such as Santa Cruz, Duff, Tikopia, Fataka, Cherry, and the atoll of Ontong Java are included within this political unit of Oceania. The islands of Bougainville and Buka, which belong politically to Papua New Guinea, are also in the Solomon Islands archipelago.

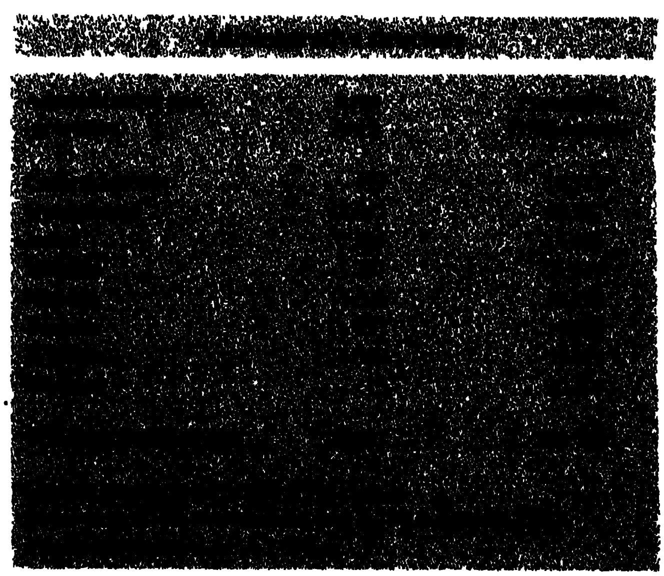
The Solomons are of volcanic origin and largely mountainous. The highest elevation is Mt. Makarakombou (8028 ft [2447 m]) on Guadalcanal. There is still considerable volcanic activity, particularly in the central section; secondary volcanic phenomena are widespread throughout the archipelago. Some of the islands are coral reefs, and of these, the Ontong Java atoll is one of the largest in the world.

Situated between the equator and the Tropic of Capricorn, the Solomon Islands are characterized by high temperatures (mitigated by ocean breezes) and abundant rainfall (a yearly average of over 117 in. [3000 mm]). Consequently the mountains are covered by an extremely dense rainforest.

Population. The population is predominantly Melanesian, with Micronesian and Polynesian minorities and more recent additions of Chinese and Europeans. Current demographic growth is particularly high, with an annual growth rate of 4%. The urban population is less than 11% of the total; the capital, Honiara, the only city of any importance, has just over 35,000 inhabitants. A pidgin English and various local dialects are widely spoken; English is the official language. Most people are Protestant, although some are Catholic or animist.

Economic summary. Until a short time ago the economy of the Solomon Islands was based almost exclusively on copra (extracted from the coconut palm, which is grown on a large scale) and on timber obtained from the extensive, luxuriant forests. However, recent years have seen considerable efforts to diversify the economy, taking better advantage of the country's significant natural resources. As a result, exports today include sweet potatoes (63,800 t in 1991), palm oil (24,750 t), cocoa (3300 t), and fish (62,700 t caught in 1989), as well as copra (38,500 t in 1991) and timber (49,390 t). Bananas, another crop, are important for domestic use.

Australian and Japanese mining companies have uncovered



Socioeconomic data

Income (per capita, US$)	580 (1990)
Population growth rate (% per year)	4.0 (1980–89)
Birth rate (annual, per 1,000 pop.)	41 (1989)
Mortality rate (annual, per 1,000 pop.)	5 (1989)
Life expectancy at birth (years)	64 (1989)
Urban population (% of total)	10.4 (1989)
Economically active population (% of total)	24.8 (1985)
Illiteracy (% of total population)	45.9 (1991)
Available nutrition (daily calories per capita)	2,120 (1989)
Energy consumption (10^6 tons coal equivalent)	64 (1987)

deposits of gold, copper, silver, bauxite, and phosphates. Future exploitation of these resources, and more generally the entry of the Solomon Islands into the international market (trade is now restricted to relationships with Australia and Japan), will also depend on the development of transportation facilities, currently limited to a modest network of roads and to a more substantial maritime transport system.

Historical and cultural profile. The Solomon archipelago, which was discovered by the Spaniard Alvaro de Mendaña de Neira in 1568, was "rediscovered" after two centuries of oblivion by the Frenchman Louis Antoine de Bougainville. During the 19th century two protectorates were established: by Germany on the northern islands, and by Great Britain on the southern ones. The latter ended up encompassing almost the entire archipelago as a result of diplomatic treaties between the two powers.

During World War II the islands were occupied by the Japanese and became the scene of bloody air, sea, and land battles that were crucial to the outcome of the war in the Pacific. U.S. forces landed on Guadalcanal in 1942 and the Japanese evacuated the archipelago in 1943.

In 1960 a legislative and an executive council were established and in 1978 the Solomon Islands became an independent state under the leadership of Prime Minister Peter Kenilorea.

In December 1986 the Legislative Assembly elected Prime Minister Ezekiel Alebua of the United Party (UP) to succeed Kenilorea (of the same party), who was forced to step down due to irregularities in the distribution of foreign aid received from France. In 1989 the People's Alliance Party (PAP) won control of the Parliament, and consequently, its leader, Solomon Mamaloni, who had been Prime Minister once before (1981–84), replaced Alebua. In 1993 a general election was held, which Mamaloni lost by a narrow margin to Francis Billy Hilly.

Both ethnic differences and the enormous longitudinal extension of the islands have impeded the formation of a homogeneous culture. As a result, the indigenous arts are rather diverse: objects of everyday use, often painted and carved, are of particular interest, being noted for their formal elegance. Traditional crafts characteristically include the use of shell inlay. Some of the most unusual objects include rituals bowls up to 3 ft [2 m] high in the form of a huge bird holding a fish in its beak, and large wooden sharks with hollow bodies, made to hold the skulls of deceased leaders.

WESTERN SAMOA

Geopolitical summary

Official name	Independent State of Western Samoa; Malo Sa'oloto Tuto'atasi o Samoa i Sisifo
Area	1,093 mi² [2,831 km²]
Population	157,158 (1986 census); 163,000 (1993 estimate)
Form of government	Independent state within the Commonwealth. The present head of state and of the executive branch will hold office for life; future heads of state will be elected every 5 years. The Legislative Assembly is elected by partial suffrage every 3 years.
Administrative structure	2 large islands and 21 districts
Capital	Apia (pop. 35,000; 1983 estimate)
International relations	Member of the UN, Commonwealth, and SPF (South Pacific Forum); associated with the EC.
Official language	Samoan; English
Religion	Protestant majority; Catholic (21%)
Currency	Tala

Natural environment. The Independent State of Western Samoa includes the two main islands of Savai'i and Upolu, the smaller islands of Apolima and Manono, and five small uninhabited islands. This is the western part of the Samoan archipelago, the eastern portion of which is an unincorporated territory of the United States. Western Samoa is located between latitudes 13° and 15° S and between longitudes 168° and 173° W.

The territory of Savai'i is dominated by a large basalt cone (Mt. Silisili, 6091 ft [1857 m]), the slopes of which are dotted by some fifty smaller volcanic craters (currently inactive) and marked by abundant recent lava flows (the last major eruption was in 1905). As a result, the urban settlements have grown up along the coast. Upolu, home to 75% of the population, has older

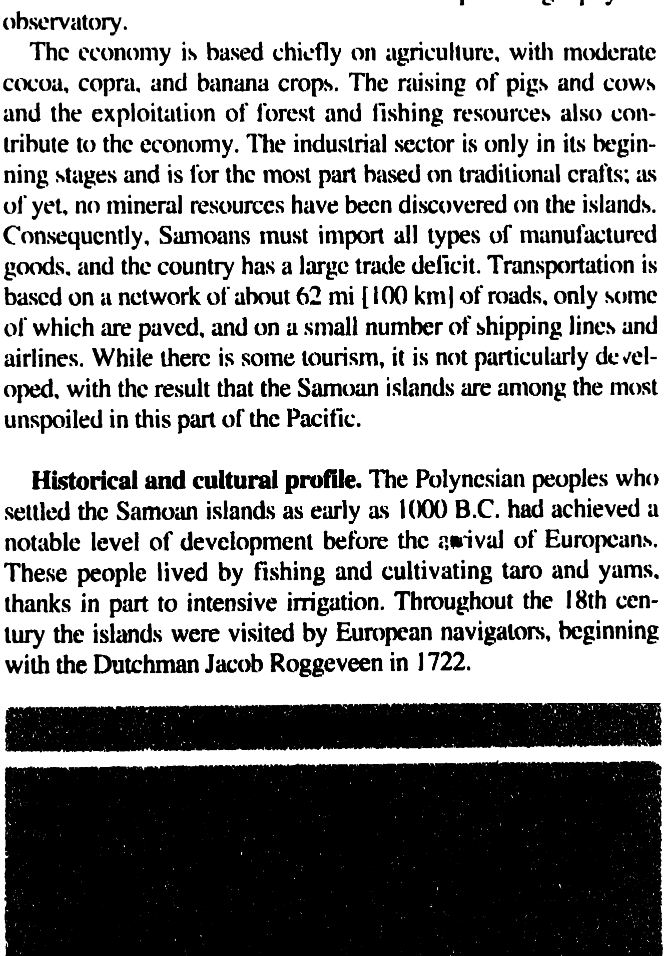
volcanic origins, is richer in vegetation (in the north), and has picturesque lagoons. Its highest peak is Mt. Fito (3608 ft [1100 m]). The smooth, harborless coasts are often bordered by coral reefs, particularly in the Apolima Strait (which separates the two large islands) and north of Upolu.

The climate is typically equatorial, with average annual temperatures of about 79°F [26°C] and particularly abundant rainfall during the summer. The vegetation is lush and typically tropical.

Population and economy. The population is made up predominantly of Samoans, an indigenous group of Polynesian origin, with only a small number of Europeans and Asians. The Samoans experienced a sharp demographic decline at the end of the 18th century following the arrival of European settlers, then recovered, and finally stabilized at the current annual growth rate of 0.8%. Today, the population is primarily rural with an urban population of just over 21% concentrated in Apia, the capital, a European-style commercial center founded at the time of German colonization and the site of an important geophysics observatory.

The economy is based chiefly on agriculture, with moderate cocoa, copra, and banana crops. The raising of pigs and cows and the exploitation of forest and fishing resources also contribute to the economy. The industrial sector is only in its beginning stages and is for the most part based on traditional crafts; as of yet, no mineral resources have been discovered on the islands. Consequently, Samoans must import all types of manufactured goods, and the country has a large trade deficit. Transportation is based on a network of about 62 mi [100 km] of roads, only some of which are paved, and on a small number of shipping lines and airlines. While there is some tourism, it is not particularly developed, with the result that the Samoan islands are among the most unspoiled in this part of the Pacific.

Historical and cultural profile. The Polynesian peoples who settled the Samoan islands as early as 1000 B.C. had achieved a notable level of development before the arrival of Europeans. These people lived by fishing and cultivating taro and yams, thanks in part to intensive irrigation. Throughout the 18th century the islands were visited by European navigators, beginning with the Dutchman Jacob Roggeveen in 1722.



Socioeconomic data

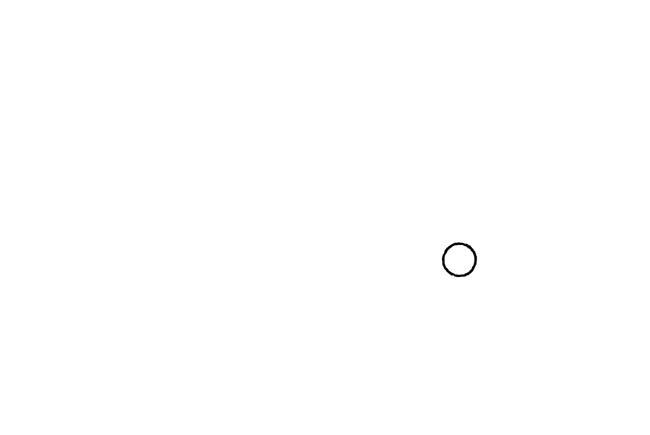
Income (per capita, US$)	730 (1990)
Population growth rate (% per year)	0.8 (1980–89)
Birth rate (annual, per 1,000 pop.)	34 (1989)
Mortality rate (annual, per 1,000 pop.)	7 (1989)
Life expectancy at birth (years)	66 (1989)
Urban population (% of total)	21.2 (1989)
Economically active population (% of total)	–
Illiteracy (% of total population)	50.6 (1991)
Available nutrition (daily calories per capita)	2,474 (1989)
Energy consumption (10^6 tons coal equivalent)	57 (1987)

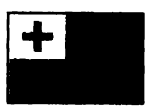
In 1891 the famous English writer Robert Louis Stevenson moved permanently to Upolu, where he led an extremely tranquil and productive life, respected and loved by the native Samoans. When Folco Quilici visited the island he paid his respects at Stevenson's grave:

> *... December 3, 1894, the drums announced: "Tusitala is dead." Tusitala* ["teller of tales" – Ed.] *was the Polynesian name for the English writer Robert Louis Stevenson. He had been called this by the local chiefs, who knew how much Stevenson had wanted to rest in eternity on that wild mountain – never climbed by humans —on the slopes of which he had lived out the last two years of his life. Tusitala was a great friend; for him, they moved rocks, uprooted trees, and cut the dense tropical underbrush to prepare a path up to the summit, so that he could be buried where he had wanted.*
>
> *On the green-covered peak, Stevenson's tomb is a rough cement slab, partially covered by shrubbery, beyond which one can glimpse the horizon from which there rises the roar of the ocean wave against the coral reef.*
>
> *"Under the wide and starry sky / Dig the grave and let me lie. / Glad did I live and gladly die, / And I laid me down with a will. / This be the verse you grave for me: / 'Here he lies where he longed to be; / Home is the sailor, home from the sea, / And the hunter home from the hills.'"*
>
> *This is what is written on Stevenson's grave, in English and in Samoan -the final phrase in the story of a life begun facing another horizon, that of the leaden North Sea of Scotland where Stevenson was born. A long road had brought this man to die in a land so distant from where he was born; a life of marvelous events, the dramatic end of which would contribute decisively to the creation of the "myth of the South Seas," the romantic claim that still weighs on the reality of the Pacific.*

The islands were the subject of disputes between the European powers until 1889, when Great Britain, Germany, and the U.S. agreed upon a sort of "tripartite protectorate" over the archipelago, which, with the withdrawal of the British ten years later, was transformed into a codominion arrangement. The U.S. oversaw the eastern islands, which are still under its guardianship, while the western islands remained under German colonial rule until World War I. In 1920 the League of Nations granted New Zealand a mandate over the western islands, a relationship that was changed to a UN trust territory in 1947. In 1962 Western Samoa became the first archipelago in Oceania to become an independent state; it has been a member of the Commonwealth since 1970 and of the UN since 1976.

TONGA





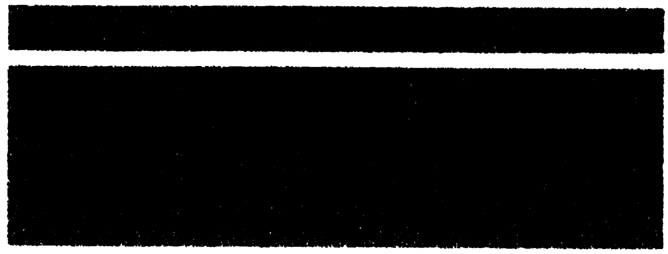
Geopolitical summary

Official name	Pule'anga Fakatu'i 'o Tonga (Kingdom of Tonga)
Area	289 mi^2 [748 km^2]
Population	96,300 (1990 estimate)
Form of government	Independent constitutional monarchy within the Commonwealth. The Legislative Assembly is elected by partial suffrage every 3 years.
Administrative structure	5 divisions
Capital	Nuku'alofa (pop. 21,383; 1986 census)
International relations	Member of the Commonwealth and SPF (South Pacific Forum); associated with the EC.
Official language	English and Tongan
Religion	Protestant majority; Catholic 15%
Currency	Paanga

Natural environment. The Tonga Islands (Friendly Islands) consist of 150 islands and islets east of Fiji and south of Samoa and scattered between latitudes 15° and 23° S and longitudes 173° and 176° W of Greenwich.

The Tonga Islands are arranged in two nearly parallel groupings that run from northeast to southwest. The western, almost uninhabited group is volcanic in origin and mountainous, culminating in Kao, a 3378-ft [1030-m] active volcano. The eastern group of islands is calcareous and includes three distinct archipelagoes: the Vava'u islands in the north, the Ha'apai in the center, and the Tongatapu in the south. The island of Tongatapu occupies half the overall territory.

The archipelago has a tropical climate, mitigated by the sea and the dominant trade winds. There are two distinct seasons, one hot and oppressive, from December to April; the other, from May to November, is milder and characterized by rather marked



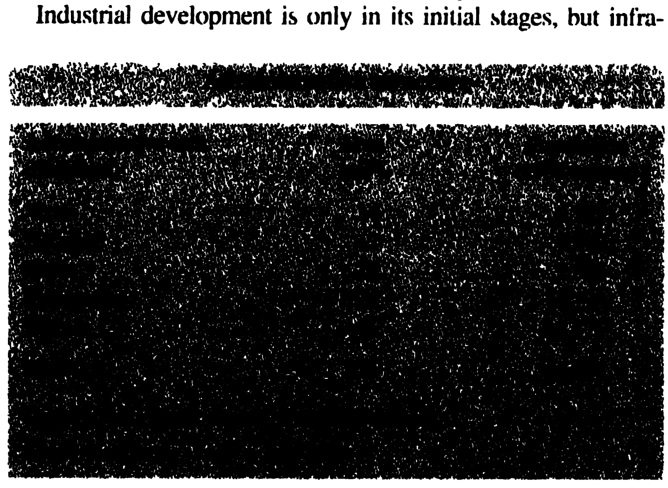
diurnal temperature fluctuations. Average temperatures are about 75°F [24°C]. Rainfall is not abundant since the modest altitudes are not sufficient for the humidity carried by the trade winds to be condensed. Cyclones are frequent and often cause extremely serious damage. Most of the vegetation consists of commercially useful trees, such as coconut and banana palms.

Population. The present-day population, made up of Polynesians, is still the original ethnic stock. In fact, unlike the other Pacific archipelagoes, Tonga has not experienced any recent migrations to or from its islands, which cover an overall area of 289 mi^2 [748 km^2] and are inhabited by over 96,000 people, with a density of about 334 people per mi^2 [129 per km^2]. Demographic growth is rather high, with an annual growth rate of 5%. Over half the inhabitants live in the Tongatapu and Vava'u islands. Nuku'alofa, the country's capital and only sizable urban center is located in the former group. The official languages are English and Tongan; most of the population is Protestant.

Economic summary. High demographic growth and scarcity of land in an agricultural economy led to a high level of temporary emigration to New Zealand (which is no longer feasible) and to chronic unemployment. This crisis pushed the government to open new economic possibilities through both state-controlled tourism, aided by Japanese capital, and a strong increase in fishing.

Nevertheless the economy is still almost exclusively agricultural. The principal export products are copra (1100 t in 1991), bananas (1100 t), coconuts, and vanilla. Cassava (16,500 t) and sweet potatoes are grown for domestic consumption. There is practically no livestock. Fishing supplies an important part of the local diet (2946 t caught in 1988) and takes advantage of the deep waters, but relies mostly on rudimentary means.

Industrial development is only in its initial stages, but infra-



Socioeconomic data

Income (per capita, US$)	1,100 (1990)
Population growth rate (% per year)	5.2 (1980–89)
Birth rate (annual, per 1,000 pop.)	27 (1989)
Mortality rate (annual, per 1,000 pop.)	5 (1989)
Life expectancy at birth (years)	67 (1989)
Urban population (% of total)	20.3 (1989)
Economically active population (% of total)	–
Illiteracy (% of total population)	4 (1991)
Available nutrition (daily calories per capita)	2,964 (1989)
Energy consumption (10^6 tons coal equivalent)	32 (1987)

structures for tourism are being encouraged. Artisanal crafts are widespread and include thin woven fabrics and "tapa" (a cloth of beaten bark), plaited mats and baskets, as well as wood and metal ornaments. There is a trade deficit, and the country depends heavily on financial aid from abroad (particularly from the Commonwealth nations and from the European Community).

Communications among the various islands is rather difficult. The main airport is located on the island of Tongatapu; the chief port is Nuku'alofa.

Historical and cultural profile. The Tonga islands were populated by successive waves of migrating peoples who probably came from the islands of southeast Asia. Sometime around the second millennium B.C., these groups arrived at a common center in Polynesia, from where they spread out to the various archipelagoes during the 10–15th centuries.

The archipelago was discovered by the Dutch navigators Jakob Le Maire and Wilhelm Corneliszoon Schouten in 1616. In 1773 James Cook spent several months there and was very well received by the indigenous people, which is why he gave the islands the name "Friendly."

In the early 18th century the Tongan islands were organized into a feudal-type state, with an absolute sovereign and assemblies of nobles and commoners. The end of that century saw revolts and disorders that continued for decades. In 1822 the Protestant evangelization of the islands began. This period also marked the ascent of a sovereign who unified the three traditional dynasties of the archipelago and became a Methodist. In 1845 he took the royal title of King George Tupou I, a sign of his pro-British sympathies.

During the 19th century the archipelago, which was considered neutral territory, avoided European occupation. In 1900, in order to prevent any attempt at annexation by Germany, which was then occupying nearby Samoa, Tonga requested and obtained British protection. The treaty with Great Britain was revised in 1958 and 1967, with a gradual increase in powers granted to local authorities.

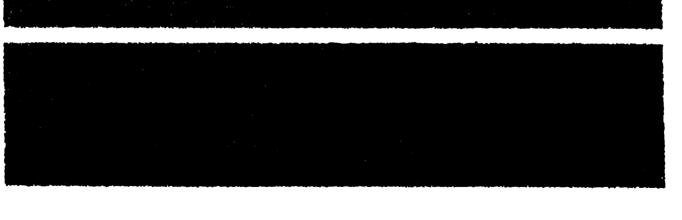
In 1970 the Tongan Islands acquired national sovereignty within the Commonwealth. A constitutional monarchy was established, and the elections of 1981 gave a majority to the conservatives within the Legislative Assembly. One of the islands' most delicate problems in recent years has been the protests against French nuclear experiments in the Pacific.

TUVALU

Geopolitical summary

Official name	Tuvalu
Area	9 mi² [24 km²]
Population	9,100 (1990 estimate)
Form of government	Independent state within the Commonwealth; head of state is the British sovereign, represented by a governor-general. Members of Parliament are also members of island councils
Administrative structure	An urban council (on Funafuti) and 8 island councils
Capital	Fongafale (pop. 3,432, 1985 estimate)
International relations	Member of Commonwealth and SPF (South Pacific Forum); associated with the EC.
Official language	English and Tuvaluan
Religion	Predominantly Protestant
Currency	Australian dollar

Natural environment. The Tuvalu Islands are a small archipelago made up of a group of atolls in equatorial Micronesia, east of the Solomon Islands and south of the Gilberts. The islands are rather low in elevation, rising only a few feet above sea level. The soil is not very fertile, with scarce vegetation that consists essentially of coconut palms and pandanus.



The climate is equatorial, with high temperatures that are mitigated by the presence of trade winds. Precipitation is abundant, generally more than 79 in. [2000 mm] annually, occasionally reaching as much as 138 in. [3500 mm].

Population and economy. The Polynesian population speaks Tuvaluan and English and is predominantly Protestant. Settlements consist for the most part of villages with huts or wooden houses; the principal center is the capital, Fongafale (pop. 3,432 in 1990), located on Funafuti Atoll.

The traditional economy is based on subsistence agriculture. Arable land is scarce and the soil poor, and the only important crop is copra, the production of which has increased greatly in recent years. Fishing, important as a source of food for the local population, is currently pursued with somewhat rudimentary methods, but prospects for development are good.

Financial assistance from the United Kingdom, the former colonial power, is absolutely essential to the Tuvaluan economy and has been provided since the island group gained independence. Considerable aid also comes from New Zealand and Australia, as well as from European bodies and the UN.

There are few air and sea links to the outside world. A seaplane service operates between some of the islands.

Historical and cultural profile. Until a few years ago, the Tuvalu group was known as the Ellice Islands. Regular contacts with Europeans began only at the beginning of the 19th century. Between 1850 and 1875 many of the indigenous people were deported as slaves. In 1892 the islands, along with the nearby Gilberts, were declared an English protectorate and were annexed as a colony in 1916, with the shared name of the Gilbert and Ellice Islands Colony.

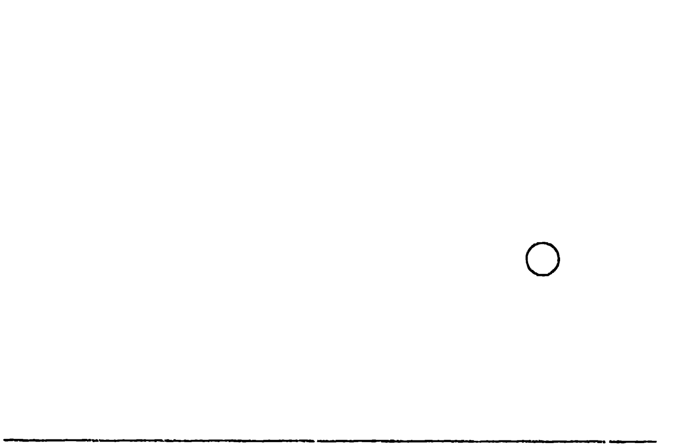
In the early 1970s a process began that would lead to the self-government of the islands. On the basis of ethnic differences, the Polynesian inhabitants of the Ellice Islands chose in a 1974 referendum to separate from the Gilberts, which are inhabited by Micronesians.

The Ellice group achieved independence on October 1, 1978, and took the name Tuvalu. The Gilbert Islands did likewise the following year, adopting the name Kiribati.

Socioeconomic data

Income (per capita, US$)	1,200 (1990)
Population growth rate (% per year)	1.2 (1980–89)
Birth rate (annual, per 1,000 pop.)	27 (1989)
Mortality rate (annual, per 1,000 pop.)	10 (1989)
Life expectancy at birth (years)	61.5 (1989)
Urban population (% of total)	31.2 (1989)
Economically active population (% of total)	–
Illiteracy (% of total population)	4.5 (1991)
Available nutrition (daily calories per capita)	–
Energy consumption (10^6 tons coal equivalent)	–

VANUATU



Geopolitical summary

Official name	Republic of Vanuatu
Area	4707 mi² [12,190 km²]
Population	142,944 (1989 census)
Form of government	Independent republic within the Commonwealth. The single-house Parliament is elected every 4 years; the President every 5 years.
Administrative structure	11 regions
Capital	Vila (pop. 19,400; 1989 estimate)
International relations	Member of UN and Commonwealth; associated with the EC
Official language	English, French, and Bislama (an English pidgin); other Melanesian languages widespread
Religion	Christian (80%); animism quite widespread
Currency	Vatu

Natural environment. The New Hebrides archipelago, formerly under joint English-French rule, became an independent republic within the Commonwealth in 1980 and is now known as Vanuatu. The country includes the New Hebrides (with the principal islands of Espíritu Santo, Maéwo, Pentecost, Éfaté, and Tanna) and two other island groups, the Torres and Banks Islands. Occupying a region roughly between 13° and 21° S latitude, it is made up of some forty islands, with an overall area of 4707 mi² [12,190 km²]. The archipelago is formed mostly of volcanic or sedimentary rocks from the Tertiary and Quaternary periods and is still characterized by volcanic activity, with frequent active phases and destructive eruptions (like the 1951 eruption of Mt. Benbow, on the island of Ambrym, which forced the population to flee and move elsewhere). There is also fre-

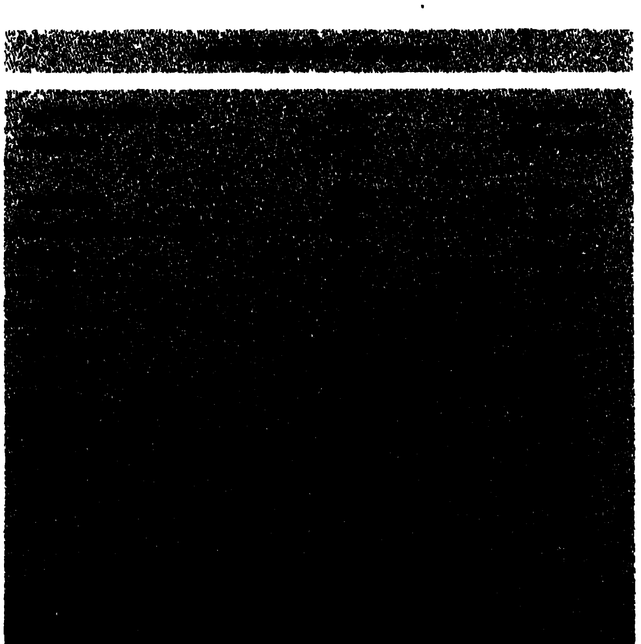
quent seismic activity. The climate is maritime tropical, hot and humid. The vegetation consists of dense impenetrable rainforest.

Population. Indigenous Melanesians make up the largest part of the population, but there are also Asian and European minorities. After considerable demographic decreases from the time of the European arrival until 1920 (due to the spread of new diseases and the removal of indentured local workers to the sugar cane plantations of Queensland), there has been a notable increase, and the annual growth rate is now 3.3%.

The national language is Bislama, an English pidgin; English and French are also official languages. Animist cults predominate. The urban population is about 29% of the total; the principal city is Vila, on the island of Éfaté.

Economic summary. The most important sector is agriculture; in fact, over 80% of the population lives in rural areas and an analogous percentage of the economically active population is involved in agriculture. The principal crops are coconut palms (322,300 t of coconuts and 308,000 t of copra in 1991), coffee, and cocoa (2,200 t). Forest resources are considerable (2,224,000 ft^3 [63,000 m^3] of round timber harvested in 1991); livestock raising, particularly of cattle, is moderately important, and 3674 t of fish were caught in 1989.

The country's major mineral resource, manganese, is in the process of being depleted. The manufacturing industry is in an early stage, while tourism is quite developed. There is a severe trade deficit, since the country must import almost everything



Socioeconomic data

Income (per capita, US$)	1,640 (1990)
Population growth rate (% per year)	3.3 (1980–89)
Birth rate (annual, per 1,000 pop.)	33 (1990)
Mortality rate (annual, per 1,000 pop.)	4 (1990)
Life expectancy at birth (years)	69 (1989)
Urban population (% of total)	29 (1989)
Economically active population (% of total)	–
Illiteracy (% of total population)	47.1 (1991)
Available nutrition (daily calories per capita)	2,533 (1989)
Energy consumption (10^6 tons coal equivalent)	25 (1987)

(capital and consumer goods). Copra, timber, fish, and manganese are exported. Sea routes provide the major link to the outside world, and the principal trading partners are Australia, Japan, the U.S., France, and Great Britain.

Historical and cultural profile. These islands were populated by successive waves of Melanesians, Papuans, and Polynesians, who created some of the most original art forms in all of Oceania (reshaped skulls, statues carved out of trunks of treelike ferns, masks made from bark). Captain James Cook, who landed there in 1774, named the islands the New Hebrides. In 1878 France and England pledged to respect the islands' independence, but in 1884 France, under pressure to protect the interests of French planters in the region, placed the islands under the control of the governor of New Caledonia.

The occupation of two of the islands, to quell disorders there, led to intervention by the English. After long negotiations, the governments in London and Paris signed a treaty on November 16, 1887, which marked the beginning of joint Anglo-French administration of the New Hebrides, with a condominium government being established in 1906. The agreement proved to be rather fragile, however, and on October 20, 1914, France and Great Britain drew up a new treaty, replaced by a protocol that same year, which was ratified in 1922. During World War II the islands were one of the most important Allied bases in the Pacific war against Japan.

In 1972 the pro-British National Party was established (later called the Vanuaaku Party), which, two years later, opposed the Union of the New Hebrides Communities, a pro-French entity. The elections of November 1975 marked the victory of the Vanuaaku Party, which won once again in the elections of November 1979. Father Walter Lini, leader of the party, was elected prime minister.

Independence was proclaimed on July 30, 1980; the following year the new Republic of Vanuatu joined the UN. In 1987 the Vanuaaku Party won elections in the Legislative Assembly, despite a notable decrease in voting, and Lini was again named prime minister. The 1991 elections, however, were won by the Union of Moderate Parties led by Maxine Carlot Korman.

Vanuatu culture is known for its memorial statues, large-scale figures carved from the trunks of tree ferns, and for masks made out of wood, clay, and various other materials. Pictorial art, a less significant form of creative expression on the islands, adorns the facades of ritual houses. Mostly geometric motifs are used in the decoration of furnishings.

POSSESSIONS

The first Europeans to set foot on the Pacific islands were members of Ferdinand Magellan's historic expedition who landed on the island of Guam in the Marianas on March 6, 1521. It was not until somewhat later that the major European powers became interested in the archipelagoes of Oceania, which were frequented by traders, whalers, missionaries, and adventurers.

Spain, which had a permanent settlement on Guam, located along the sea routes linking Mexico and the Philippines, turned its attention principally to Micronesia (the Marquesas and Caroline Islands), while Great Britain, particularly after James Cook's voyages, focused on New Zealand and other Polynesian islands. France also took an interest in Polynesia, encouraged by detailed reports of the voyages of Jules Dumont d'Urville and Louis-Antoine de Bougainville. Other European countries came later; western New Guinea was occupied by Holland (1828), the northeastern part of the island by Germany (1884). It was not until 1898 that the U.S., as a consequence of the Spanish-American War, took control of large areas of the Pacific, from the Philippines to Hawaii, including the important base of Guam.

Actual partition of the Pacific among the European powers took place at the end of the 19th century, simultaneously with their division of Africa. Germany, which already ruled the Marshalls (1878) and Nauru (1888) as protectorates, purchased the Carolines and the rest of the Marianas from Spain (1899) and agreed with the U.S. to partition the Samoan islands (1900). The outcome of both world wars changed the political framework of European possessions in the Pacific. In 1914 the German presence was completely eliminated and the Japanese, who had replaced the Germans in Micronesia, were gone after 1945.

After World War II nearly all the former British colonies and protectorates gradually became independent, while France transformed its possessions into Overseas Territories. The U.S., charged by the UN with the trusteeship of the Marshall and Caroline archipelagoes, led these islands toward autonomy and then independence (1990), maintaining direct control only over Hawaii, which had become the 50th state (1959), the Northern Marianas, part of Samoa, and some other minor islands.

Today other Pacific islands are directly ruled by Australia (Norfolk, the Coral Sea Islands, and Macquarie), by New Zealand (Cook, Niue, and Tokelau), and by some Latin American countries (Chile, Ecuador, Colombia, Costa Rica, and Mexico). Japan regained sovereignty over some archipelagoes and islands to its southeast (Bonin, Volcano, Daito, Parece, Vela, and Marcus).

Overall, the territories still dependent on European nations (France and the United Kingdom) cover an area of over 8878 mi^2 [23,000 km^2] including interior lagoons, with a population of approximately 385,000. Excluding territories that are now part of formally independent states (such as Hawaii, Irian Jaya, the Bismarcks, Lord Howe and Easter islands, etc.), the possessions of countries bordering the Pacific (United States, Australia, and New Zealand) extend over more than 772 mi^2 [2000 km^2] and have about 250,000 inhabitants. Like the other Pacific island territories, these too are almost all volcanic in origin, edged by coral reefs that often outline wide interior lagoons. The volcanic nature of the region is the result of numerous fractures to the Pacific undersea ridges, and eruptive activity is frequent and considerable. Only New Caledonia, structurally connected to the mountains of New Zealand and New Guinea, has sedimentary and crystalline formations caused by Cenozoic folding.

The climate is predominantly tropical and humid, with abundant, steady rainfall throughout most of the year, generally regulated by the trade winds. Average annual precipitation usually exceeds 78 in. [2000 mm], and is even double that in some areas. Where the vegetation has not been modified by human intervention, it consists of tropical evergreen forests with an abundance of palms, particularly the coconut variety, as well as fruit and hardwood trees. Mangroves are common along the coasts. Wildlife is significant (particularly birds and insects, as well as marine life), although the introduction of domestic species by Europeans has resulted in many modifications.

AUSTRALIAN POSSESSIONS IN OCEANIA

Directly ruled by Australia, the island of Norfolk is located between New Caledonia and New Zealand. Some 2000 people inhabit an area of 14 mi^2 [36 km^2], where they cultivate grains, citrus fruits, bananas, and vegetables. Tourism is growing.

Discovered by James Cook on October 10, 1774, Norfolk Island was set aside by the British government as a penal colony from 1778–1813 and again from 1825–55.

A separate colony until 1897, it then became part of the Australian region of New South Wales; in 1913 control was transferred to the Australian central government. In 1979 the island obtained self-rule for the management of its internal affairs, with an executive council at the disposal of an administrator who is appointed by the governor-general of Australia.

Macquarie Island (68 mi^2 [176 km^2]) is located about 930 mi [1500 km] southeast of Tasmania and is under its direct administration. It is the site of a scientific observatory.

BRITISH POSSESSIONS IN OCEANIA

The island of Pitcairn (1.8 mi^2 [4.6 km^2], with a population of 52 in 1991) and its outer islands, Ducie, Oeno, and Henderson (annexed in 1902) constitute the only British colonial possession

in the Pacific; they are located southeast of Gambier, along the sea route to Easter Island. Discovered in 1767 by Philip Carteret and occupied in 1790 by the mutineers of the *Bounty*, it became a British colony in 1839 and is administered by a High Commissioner who lives in Wellington, New Zealand. The capital is Adamstown. Almost all essential goods are imported.

CHILEAN POSSESSIONS IN OCEANIA

Chile has two possessions in Oceania, Easter Island (62.7 mi^2 [162.5 km^2], pop. 2095 in 1989) and Sala y Gomez (0.05 mi^2 [0.12 km^2], uninhabited). The name of the former island derives from its discovery by Jacob Roggeveen on Easter Day in 1772; it is grouped with the mainland region of Valparaiso. Made up of ancient extinct volcanos, it has average daytime temperatures of approximately 68°F [20°C].

The population, originally Polynesian but now an amalgam of Europeans, Chileans, and Polynesians, is engaged in stock raising (sheep and pigs), farming (corn, sweet potatoes, and fruit), and fishing (tuna, conger eel, and lobster). Tourism provides a good source of revenue, with many people coming to see the famous *moai*, the over 300 gigantic statues (7–33 ft [2–10 m] high, in dense trachyte) scattered throughout the territory, depicting human figures without legs, hands resting on their stomachs, usually erected on special altar-platforms (*ahu*).

FRENCH POSSESSIONS IN OCEANIA

France is the only European power that has kept numerous and important territories in the South Pacific under its control. These Overseas Territories are represented by their own deputies to the French parliament. Overall, they cover an area of more than 8878 mi^2 [23,000 km^2] and have a population of about 380,000 inhabitants.

New Caledonia. Discovered by Louis-Antoine de Bougainville in 1768, New Caledonia lies about 1050 mi [1700 km] northwest of New Zealand and 930 mi [1500 km] east of Australia. The territory, which includes numerous islands, extends over an area of 7356 mi^2 [19,058 km^2] and has 164,173 inhabitants (1989). Most of its land area consists of a single large island, New Caledonia (6466 mi^2 [16,750 km^2]), that extends in a northwest-southeast direction for about 250 mi [400 km]. Completely mountainous, its peaks often exceed elevations of 3300 ft [1000 m], culminating in Mont Panié (5340 ft [1628 m]). Its rather jagged coasts are fringed by coral reefs. In geological terms, the island is made up predominantly of sedimentary rocks creased and partially metamorphosed by Cenozoic folding. The southern portion has basic crystalline outcroppings of the peridotic type, these too positioned by Cenozoic folding, along with other crystalline rocks (gabbro, granodiorite, etc.) rich in metal ores such as nickel, chromium, iron, cobalt, copper, manganese, gold, tungsten, molybdenum, and mercury. The southern Isle of Pines is made up of peridotic rocks, while the nearby Loyalty Islands are formed from organogenic (coral reef) layers that partially cover volcanic (basaltic) rocks, as on Maré Island.

The climate is tropical, tempered by ocean breezes and the trade winds, but marked by violent cyclones during the hot, rainy season (January–March). The leeward western islands receive less precipitation (about 39 in. [1000 mm] annually) and have more stable temperatures. In Koumac and Nouméa average monthly temperatures range from 79°F [26°C] in January to 68°F [20°C] in July, while on Lifou in the Loyalty Islands temperatures are slightly lower and annual rainfall exceeds 62 in. [1600 mm].

The coastal and lower areas of New Caledonia are blanketed by typical tropical vegetation, with evergreen forests (coconut palms, euphorbium, casuarina trees, ferns, and the like), that thin out in the highest regions and along the western slopes, where they are replaced by dry undergrowth and savanna with various species of araucaria trees. New Caledonia is also rich in endemic plant species, noteworthy among which is the highly fire-resistant niaouli (genus *Melaleuca*). Wildlife is scarce and has been greatly changed since the introduction of non-native species by Europeans, but the marine life is rich and varied, encouraged by the presence of a coral reef enclosure over 500 mi [800 km] long.

The ethnic composition is 45% Melanesian (Kanak) and 34% European. The remainder consists of immigrants from Indonesia and from other French islands in the Pacific (Wallis and Tahiti).

The economy is based principally on mining (New Caledonia is the world's fourth largest producer of nickel, with about 66,000 t mined annually, some of which is used to supply the local metallurgy industry and the rest exported), followed by stock raising (cattle, goats, and pigs) and agriculture (coconuts, corn, sweet potatoes, and manioc). Fishing activity is negligible, while the forests, reduced to barely 10% of the island's area, provide prized species such as sandalwood and niaouli.

The main air and naval base is located in Nouméa (approximately 65,000 inhabitants) capital of the territory, which is divided administratively into three provinces. In addition to the island of New Caledonia, the territory of New Caledonia includes the Isle of Pines (59 mi^2 [152 km^2], pop. 1465) to the southeast, the Bélep coral archipelago (27 mi^2 [70 km^2], pop. 745) to the northwest, and the Loyalty Islands (Maré, Lifou, and Ouvéa), located 62 mi [100 km] east of New Caledonia (765 mi^2 [1981 km^2], pop. 17,912 overall). There are also some lesser, mostly uninhabited islands: the Chesterfields (4 mi^2 [10 km^2]), located 341 mi [550 km] west of Bélep; the Huon islands (161 acres [65 ha]), 140 mi [225 km] north of Bélep; and Walpole (4 mi^2 [1 km^2]), Matthew (49 acres [20 ha]), and Hunter (8 mi^2 [2 km^2]), respectively 93, 250, and 300 mi [150, 400, and 480 km] east of the Isle of Pines. The latter two, which experience frequent and intense volcanic activity, have been claimed by Vanuatu. In 1998 a referendum on self-rule is scheduled for the territory of New Caledonia.

French Polynesia. This territory, held by France since 1843, includes various archipelagoes located between latitudes 7° and 28° S, with an overall area of about 1550 mi^2 [4000 km^2] including interior lagoons and a population of about 188,814 (1988 census).

The official languages are French and Tahitian; the capital, Papeete (pop. 23,555), is on the island of Tahiti. French Polynesia is divided into five administrative districts: the Windward Islands (453 mi^2 [1173 km^2], pop. 140,341 in 1988), with Tahiti (402 mi^2 [1042 km^2], pop. about 115,000), Moorea (51 mi^2 [132 km^2], pop.

about 7000), Maio (3 mi^2 [9 km^2], pop. about 200), and the small islands of Mehetia and Tetiaroa; the Leeward Islands (183 mi^2 [474 km^2], pop. 22,232), with Raiatéa, Tahaa, Huahiné, Bora Bora, and Maupiti; the Tuamotu archipelago (266 mi^2 [690 km^2], pop. 12,374), with the atolls of Rangiroa, Hao, Turéia, Mururoa, and Fangataufa (the latter two used for nuclear tests since 1966), as well as the Gambier Islands (14 mi^2 [36 km^2], pop. 600) situated further east; the Austral or Tubuai Islands (63 mi^2 [164 km^2], pop. 6509), with Rimatara, Rurutu, Tubuai, Raivavae, and Rapa; and the Marquesas Islands (492 mi^2 [1274 km^2], pop. 7358), with Nuku Hiva, Ua Pu, Ua Huka, Hiva Oa, Tahuata, and Fatu Hiva. The Windward and Leeward Islands in their turn form the Society Islands group, given this name by the Royal Society of London, which financed the expedition led by James Cook that landed there in 1769, two years after their discovery by Samuel Wallis (1767) and the year after de Bougainville's voyage (1768).

The largest of the islands of French Polynesia which are all volcanic and coral in origin, is Tahiti. It is formed by the joining of two large volcanic cones, culminating in Mt. Orohena (7350 ft [2241 m]). Covered with tropical rainforest, it supports thriving plantations (cotton, sugar cane, and coffee) and the cultivation of coconut palms that supply nuts and copra. Tourism is a significant resource. The other archipelagoes of French Polynesia were discovered by the Spaniard Alvaro Mendaña de Neyra, who landed on the Marquesas Islands (1595), and by the Portuguese explorer Pedro Fernández de Quirós, who disembarked on other mountainous islands with peaks exceeding 3300 ft [1000 m], including the Tuamotus (1606). The British explorers Cook and James Wilson landed respectively on the Austral (1769) and Gambier Islands (1797). The small island of Clipperton (3 mi^2 [7 km^2]), located 682 mi [1100 km] southwest of the Mexican coast, is also part of French Polynesia.

Wallis and Futuna. Located between Samoa and Fiji, these small archipelagoes were discovered respectively by the Englishman Samuel Wallis (1767) and by the Dutchman William Schouten (1616); they became French possessions in 1842. Volcanic and coral in nature (Futuna also has sedimentary outcroppings from the Cenozoic era), they have elevations that culminate at 476 ft [145 m] on Wallis and 2509 ft [765 m] on Futuna. Extending over 98 mi^2 [255 km^2], with a total population of 15,000 (1990 estimate), they comprise two distinct archipelagoes: the Hoorn Islands, with Futuna (25 mi^2 [64 km^2], pop. over 4000) and Alofi (20 mi^2 [51 km^2], uninhabited), and the Wallis Islands, with Uvea (61 mi^2 [159 km^2], pop. approximately 10,000), where the capital Mata-Utu (pop. 1000) is located. The economy is based on agriculture (copra, cassava, and tropical fruits) and stock raising (pigs and goats).

NEW ZEALAND POSSESSIONS IN OCEANIA

New Zealand's sovereignty in the Pacific extends over three Polynesian archipelagoes: the Cook Islands, Tokelau, and Niue.

Cook Islands. The Cook archipelago is located about 1984 mi [3200 km] northeast of New Zealand, between latitudes 9° and 23° S. It is made up of 15 small islands, generally subdivided into the Northern Cook Islands, which are coral in nature and small in size, and the larger Southern Cook Islands of volcanic origin. The archipelago, which acquired full self-rule in 1965 in free association with New Zealand, extends over 93 mi^2 [240 km^2]. The climate is oceanic tropical, with average temperatures of 75°F [24°C] and an annual rainfall of about 78 in. [2000 mm].

The population of about 18,000, mostly Maori, is concentrated on the southern islands, particularly Rarotonga, where the capital, Avarua (over 9000 inhabitants), is located. The official language is English, and the Protestant faith predominates. Agriculture yields coconuts, citrus, pineapples, and bananas; pearl fishing is a traditional activity. The tourist industry is well developed.

Niue. A 100-mi^2 [259 km^2] atoll lying 250 mi [400 km] east of Tonga (19° S latitude), Niue became self-governing in 1974, in free association with New Zealand. The approximately 3000 inhabitants of Polynesian origin live in coastal villages, the largest of which is the capital Alofi. The main activity is agriculture, which supplies copra, bananas, and fruit.

Tokelau. The Tokelaus are a group of madreporic islets located north of Samoa between latitudes 80° and 10° S; they were annexed by New Zealand in 1948. The atolls cover a total area of 4 mi^2 [10 km^2] and are inhabited by some 2000 Polynesians whose main economic activity is cultivating coconut palms.

UNITED STATES POSSESSIONS IN OCEANIA

Excluding the Hawaiian Islands, the Midways Islands, and some other smaller islands, the U.S.-controlled Pacific archipelagoes and islands extend over an area of about 656 mi^2 [1700 km^2] and have a population of some 240,000 inhabitants.

Guam. Physically part of the Northern Marianas, Guam (209 mi^2 [541 km^2], pop. 133,152 in 1990) is an unincorporated territory ceded to the U.S. by Spain in 1898. The capital is Agana (pop. about 5000). The economy is based on agriculture and stock raising, as well as on food-processing and petrochemical industries. An American naval base is located at Apra.

Northern Mariana Islands. Politically this archipelago (184 mi^2 [477 km^2], pop. 43,345 in 1990) constitutes the Commonwealth of Northern Mariana Islands, with its own regulations and government. Garapan, on the island of Saipan, is the capital. The inhabitants are U.S. citizens and are actively engaged in agriculture, fishing, and stock raising.

Palau. This archipelago, made up of 26 principal islands and about 300 small islets (188 mi^2 [487 km^2] and 15,122 inhabitants in 1990), is an autonomous republic administered as a U.S. Trust Territory. The population's main economic activities are agriculture, shipbuilding, and fishing. The capital is Koror (10,501 inhabitants in 1990).

American Samoa. These islands (77 mi^2 [199 km^2], pop. 46,773 in 1990) also constitute an unincorporated territory with its own legislative and government bodies. The capital is Pago Pago (pop. 3000), on the island of Tutuila. The principal crops are bananas and coconut palms. Tourism is fairly well developed.

OCEANIA

Images

1. A hei-tiki, *a jadeite chest pendant depicting an ancestor. Despite European colonization, Maori culture, which derives from the complex religious worldview of this New Zealand ethnic group, still survives today and is one of the most interesting in Oceania. Maori art, for the most part decorative and used to embellish domestic articles and community buildings, also draws inspiration from a higher spirtual plane. Maori religious life is dominated by an ancestor cult; the depiction of great leaders from the past and heroes enables their beneficent power to be spread among the living.*

2. *View of the Blue Mountains and the peaks called "The Three Sisters." The Blue Mountain chain, which crosses eastern Australia near Sydney, has impressive granite formations that emerge from the forest as bare slopes, often divided by deep gorges due to erosion.*

3. *The island landscape of Tasmania near Port Davey. Tasmania is more or less triangular with a rather jagged coastline edged by rocks and islands. The territory is made up of a vast plateau that rises 4000–5000 ft [1200–1500 m], running northwest to southeast in a series of steep slopes similar in form and structure to those of the southeastern regions of Australia, from which this land was separated during the Quaternary. At its highest altitudes the landscape features numerous lakes and moraine deposits from the last ice age.*

4. *One of the most famous and spectacular landmarks of Australia, illuminated by moonlight: the red slopes of Ayers Rock, a unique rock formation that dates back approximately 600 million years Like an iceberg, this majestic monolith of red sandstone– about 2 mi [3 km] long by 1.6 mi [2.5 km] wide, with a circumference of almost 5.6 mi [9 km] exposes only a small part of its bulk, which rises 1141 ft [348 m] above the Earth and extends underground for more than 6800 ft [2100 m].*

5. *The snow-capped peaks of Mt. Sefton in the foreground and Mt. Cook (12,346 ft [3764 m]) in the background are among the highest in the Southern Alps of New Zealand. The mountains run nearly the entire length of the South Island, forming a more or less continuous, impassable barrier that follows the orientation of the North Island.*

6. *A violent eruption of fiery lava and steam gushes forth from the immense crater of Kilauea, a perennially active volcano located on the largest island of the Hawaiian archipelago. All the Hawaiian islands are volcanic in origin and the result of the superimposition of successive layers of basaltic lava.*

7. *Throughout New Zealand, but particularly on the North Island, there has been and continues to be considerable volcanic activity. There are fumaroles, solfataras, mofettes, and spectacular geysers such as the one shown here, where superheated steam and jets of water spurt up hundreds of feet.*

8. *The Lady Knox geyser is one of the many natural attractions in the hot-spring region of Waiotapu, New Zealand. Bubbling mud, sulfur springs, and hot springs abound in the area around Lake Rotorua. The waters of the lake, collected by some five hot-spring establishments, are considered rich in therapeutic properties and particularly curative for rheumatic and skin ailments.*

9. *A sulfurous lake in the Waiotapu hot-spring region, known as the "champagne pool." New Zealand's volcanic activity, the most recent expression of which are geysers, originally dates back to a bradyseismic movement upward that occurred during the Miocene epoch. In the succeeding Pliocene, a complex mountain-building phase began, followed by the formation of massive volcanic structures*

10. *A Polynesian sunset over the Pacific. For centuries Polynesia captured the imagination and filled the dreams of European poets, artists, and travelers, to the point where it came to symbolize in the Western collective consciousness a true earthly paradise, with its luxuriant vegetation and fertile lands, tropical climate, incomparable seas, and beautiful native peoples. According to Polynesian myth, the world emerged from the embrace of Heaven and Earth; in the Tahitian poem that tells of the origin of life, in the beginning there was nothingness, then there was steam, from which perceivable and comprehensible things were formed, then the soft land, and finally the stones and mountains.*

11. *The Great Barrier Reef extends for over 1200 mi [2000 km] along Australia's Queensland coast, from New Guinea to the Tropic of Cancer. This is one of the*

greatest natural wonders on Earth, indeed considered the "eighth wonder of the world." Discovered by the English voyager James Cook in 1770, it was formed from the calcareous skeletons of billions of minuscule sea polyps that accumulated over the course of approximately 15,000 years. The almost total absence of safe crossings through the dense reef of coral that blankets the depths has always hindered the emergence of urban centers or significant economic activity on the coasts, particularly along the central section.

12. *A tropical atoll in the Fiji Islands, which are situated in the middle of the Pacific Ocean over 1200 mi [2000 km] from the coast of New Zealand in an auspicious location along the most important trade route that runs from the ports of Auckland in New Zealand and Sydney in Australia to Honolulu in Hawaii, and on to San Francisco on the U.S. mainland. The Fiji group consists of about 320 islands of varying sizes, only a third of which are inhabited. Volcanic in origin, they are surrounded in many places by coral reefs that rise above or lie just below sea level, often impeding navigation among the archipelago's numerous atolls.*

13. *A koala resting on a eucalyptus branch, the leaves of which are its only source of nourishment. During millennia of prehistoric isolation animal life in Australia developed in forms different from those in the rest of the world. In particular, marsupials are distinguished by their pouches, which set them apart from placentate animals that evolved on other continents. The number of koalas has greatly diminished because their natural habitat was destroyed by European colonizers who also killed them for their soft, velvety fur.*

14. *The head of the Australian cassowary, a rare species of large bird with reddish-blue plumage, sprouts a horny, helmet-shaped growth that varies in size from one bird to another. Fearful and shy, the cassowary hides in the densest forests and comes out only at night, making it very difficult to observe. Australia's avifauna is among the richest in the world and includes 700 species of birds, 530 of which are endemic.*

15. *A monk seal, an extremely rare subspecies of the more common pinniped seal, swims in the Pacific waters that surround the archipelago of Hawaii. While rich in native wildlife, before the arrival of humans these island regions were strangely lacking in mammals, which were introduced later, first by the Polynesians, then by European colonizers.*

16. *Without doubt the kangaroo holds the place of honor among Australian fauna. This characteristic marsupial mammal is one of the continent's best-known symbols. It forages on grasslands in large groups, ready to leap spans of up to 30 ft [9 m] to flee danger. The native species include the giant kangaroo, which is red or gray and can grow taller than humans, and the rat kangaroo, which is less than 1 ft [30 cm] high. The decrease in this mammal's numbers dates back historically to the colonization years, when entire herds of kangaroos were massacred to safeguard the pasturelands, upon which they were grazing and which are rather rare in Australia due to the climatic conditions.*

17. *An elderly Australian Aborigine from a tribe in the Northern Territory. Surprisingly able to adapt to the various types of climate and physical environments in Australia, the Aborigines made up the only ethnic group for tens of thousands of years. Within a century of European colonization, however, they were nearly completely exterminated, along with the social and economic structure they had created and maintained for millennia prior to the arrival of outsiders.*

18. *The Papuan natives, whose residence on New Guinea dates back to ancient times, still constitute the majority of the population of the island. Subdivided into several hundred tribes by socioeconomic characteristics, they are often assimilated into groups of Melanesian origin that inhabit the coast. The Papuans developed a unique agricultural society in which women do most of the physical labor of farming, the principal economic resource of the people.*

19. *The most common Papuan dwelling is a rough rectangular hut constructed near running water and mounted on wooden piles, with a sloping roof and often having decorative elements such as painted panels or carved posts. The rear of the structure, which can be circular in form with a conical roof, usually holds a stall for animals or a storeroom. Two fundamental principles of Papuan society, the clear differentiation of social roles between the sexes and the exclusion of women from religious life, are also reflected in the arrangement of the dwellings. For this reason it is common to find family houses where women and children live and husbands go only to sleep, and a so-called "men's clubhouse," where married men live along with bachelors.*

20. *An Australian girl of Anglo-Saxon origin holding a charming koala in her arms. In Australia the descendants of Anglo-Saxon immigrants make up a majority of the population (about 80%), while other sizable segments consist of people of German, Dutch, Italian, and Yugoslav ancestry.*

21. *Two Tahitian children wearing characteristic orchid garlands around their necks and crowns of flowers on their heads. The Society Islands archipelago owes its name to the Royal Society of London, which financed Cook's expedition to the Pacific. For over three centuries, in the Western imagination, this island group has represented an exotic paradise: broad expanses of palm trees, transparent lagoons, perfumed air, and the enchanting beauty of the* wahine *—the local Tahitian girls—who symbolize free love.*

22. *Aboriginal dancers during a ritual ceremony. The participation of women in this type of tribal ritual is not always permitted. On the other hand, there are also exclusively female rituals such as those celebrating fertility, performed by some Australian native groups in the Northern Territory, in which the female is presented as the source of all that is sacred.*

23. *A native of Pago Pago, an island in the archipelago of American Samoa, steering a typical Polynesian outrigger. Fishing is undoubtedly one of the essential sources of economic survival for the local peoples; handmade nets, spears, and traps of various types are used.*

24. *Aerial view of the modern city of Canberra, the capital of Australia. Its site was chosen in 1913 as a solution to the political and economic rivalry between Sydney and Melbourne. The 1901 Constitution specified that the Australian capital, until then in Melbourne, was to be built* ex novo *in New South Wales, no less than 100 mi from Sydney. Thus Canberra arose 186 mi [300 km] from Sydney and approximately 400 mi [650 km] from Melbourne. Laid out along the banks of a tributary of the Murrumbidgee river, in a broad valley enclosed by hills on three sides, Canberra enjoys a typically continental climate with rather marked seasonal differences between the Australian winter and summer.*

25. *The Sydney (Australia) Opera House, designed by Danish architect Jorn Utzon and begun in 1959, was partially financed through a state lottery organized in New South Wales. Symbol of an architec-*

tural modernism considered by some to be too aggressive, it provides the venue for international-caliber ballet, theater, opera, and musical performances.

26. *Until 1927 Melbourne, capital of the state of Victoria, was the seat of government for all Australia. In 1835 the city began as a penal colony, taking its name from the British minister at the time, Lord Melbourne. Stretched out along the meandering banks of the Yarra river and along Port Philip Bay, Melbourne vied with Sydney until 1920 for economic and cultural primacy, a rivalry that was strengthened by the fact that Melbourne is the natural center for the export of farm and livestock products from the interior regions of the Murray basin. Broad avenues, parks, and gardens surrounded by gentle hills and small residential suburbs make up Greater Melbourne.*

27. *A nighttime view of Brisbane Bridge, one of the longest cantilever bridges in the world. Capital of Queensland since 1859, Brisbane has a moderate and almost always tranquil climate that guarantees its inhabitants almost 3000 hours of sun yearly and favors a flourishing tourist industry. Ultramodern skyscrapers, which coexist with the city's many original Victorian-style buildings, form a backdrop for the popular beaches of Australia's Gold Coast, a paradise for surfing and other water sports. While it is the only Australian state capital located along a river rather than directly on the coast, Brisbane is a significant maritime and commercial center, since it is a natural outlet for the entire interior plateau north of the Darling river basin. Thanks to the continual drainage of the river bed, Brisbane can easily accommodate large ships.*

28. *In a square in the historic center of Honolulu (Hawaii) stands the statue of King Kamehameha, adorned with garlands of exotic flowers. The dynasty of the Kamehameha sovereigns unified the Hawaiian islands, ruling them as a single kingdom for over a century, until internal disputes occasioned British and American intervention, which marked the beginning of the archipelago's colonization.*

29. *Before the construction of Honolulu's extremely modern skyscrapers, the Aloha tower was the highest building on the island. The meaning of the Polynesian term "Aloha" goes beyond its literal translation of "enjoy life in friendship" and expresses a way of life animated by kindness and hospitality that stems from ancient native religious beliefs and has always distinguished the Hawaiian people.*

30. *Aerial view of the port and railroad station of Wellington, capital of New Zealand. The city extends along the western shore of the vast and well-protected Port Nicholson Bay. The northernmost of its inlets, Lambton Harbor, is the site of the second-largest commercial port in the country, located along the shipping lanes that link New Zealand to the rest of the world.*

31. *A spectacular aerial view of an immense Australian sugar-cane plantation. Sugar cane, which is cultivated throughout Queensland and New South Wales, is the area's most significant industrial crop and constitutes an important export. The presence and utilization of the largest artesian basin in the world, drained by the Darling and Murray rivers, has allowed humans to modify preexisting environmental conditions that were unfavorable to agriculture because of a scarcity of pasture and grazing land. Within the span of only a few decades, intensive agriculture and livestock raising have been developed.*

32. *Sunset view of the dense irrigation network of a cotton field. Cotton, which is grown especially in the Australian regions of New South Wales and Queensland, was once important to the national economy, but now must compete with products from the U.S., Pakistan, and other nations.*

33. *Grain harvest in New Zealand. The crop is loaded onto trucks and transported to processing centers and commercial ports. The sparse population and special environmental conditions that impede the growth of grass in many regions of the country have encouraged a pastoral economy, where agriculture continues to be significant but is losing ground to the more specialized and developed raising of cattle and sheep.*

34. *Timber being transported along the waters of White Bay, near the Australian city of Sydney. Australian forest areas suitable for economic exploitation yield considerable quantities of prized woods, including numerous varieties of eucalyptus, which supply most of the lumber used for construction, and harder woods used for making plywood. There are also many indigenous varieties of pine, particularly throughout New South Wales and Queensland. Reforestation has been introduced after decades of indiscriminate cutting that notably impoverished the forest cover along the Great Dividing Range.*

35. *Sheep shearing on a farm in Queensland, Australia. The raising of sheep, one of Australia's most important and profitable economic activities, is extensive, with particularly suitable terrain in the vast grassy highlands in the west and east. Wool alone, especially that from the prized Merino sheep of Queensland, accounts for at least a third of all the country's exports. Despite the recent discovery of extremely rich mineral deposits, Australia's traditional economy remains anchored to two equally profitable activities: fruit and vegetable growing and the raising of sheep and cattle, the latter a primary source of wool, meat, and dairy product exports. Stock raising is threatened, however, by periods of drought that deplete the grasslands and compel sheep- and cattle-raisers to sell inferior-grade animals at extremely low prices in order to feed the remaining better specimens.*

36. *An open-pit uranium mine in Kakadu National Park (Northern Territory, Australia). A century after the "gold rush" hit the United States, the discovery of fabulous mineral reserves revolutionized the Australian economy, formerly based on stock raising and agriculture. This led to the development of industries tied to the mining of natural reserves of iron, aluminum, bauxite, uranium, and coal. Australia still possesses the world's largest reserves of extractable uranium, but their exploitation is strongly opposed by unions and by Aboriginal groups, which see their lands threatened.*

37. *Offshore oil well in Australia's Northern Territory. Drilling for oil began after the 1961 discovery of the first reserves in Moonie. Other hydrocarbon fields were then identified and exploited in various parts of the country. Australia also has an active refining industry.*

38-39. *The industrial activities of Oceania are well represented in the region's two largest countries, Australia and New Zealand. Sectors of advanced production include the iron and steel industry, with substantial output of cast iron and steel, and the metallurgical industry, which processes copper, lead, zinc, and aluminum. The first photograph shows a steel mill in Newcastle, Australia, the second a foundry in New Zealand.*

40. *View of the impressive dam over Lake Argyle, the largest artificial basin in Australia. In addition to supplying the hydroelectric industry, artificial lake basins built in the western Australian regions richest in water sources serve to irrigate farmland and to*

maintain the grazing lands set aside for livestock.

41. *Waikiki, along with Honolulu, are two of Oahu's best known beaches and extremely popular with tourists from all over the world. Oahu is Hawaii's third-largest island and has been greatly affected by American modernization, with the result that many natural and fascinating landscapes have been spoiled by skyscrapers, viaducts, and highway tunnels built only a few miles from the ocean.*

42–43. *Aboriginal rock paintings found in a part of Kakadu National Park (Northern Territory, Australia) known as Nourlangie Rock. Unlike the art forms of Oceania's islands, which are essentially those of agrarian peoples, examples of painting and sculpture by indigenous Australians represent the work of hunters and gatherers who were extremely imaginative in their use of simple stone, wood, and bone weapons and tools. Part of the continuing fascination of these paintings is their numerous references to the Aboriginal world of magic and social organization, in which role the elders held the most privileged and respected position. According to the religious beliefs of the Aboriginal artists, all creation was the work of the "Dreaming" beings, portrayed as half animal, half human, who gave people the technical tools and laws that govern the social, economic, and religious life of society. These creator beings, whose exploits were narrated in legends that differed from region to region, were the protagonists of most religious ceremonies and therefore constituted a recurring subject of rock carvings, paintings, bark sculptures, and other local forms of artistic expression.*

44-46. *Easter Island, which received its name from its discovery on Easter Day in 1722, is the site of over 300* moai *figures. The statues on the northern coast of Ahu Tahai (the first two photographs respectively show a single moai and a group of moai against an ocean background) and along the slopes of Rano Raraku volcano (third picture) are well known. Carved out of gray volcanic stone resting on a single base, the moai are about 30 ft [9 m] high and all have the same characteristic features; they depict busts with human prognathous faces posed with hands on the stomach, generally standing on a special platform-altar* (ahu). *The scarcity of wood on the island, which is arid and without interior water resources, explains the exclusive use of volcanic rock. The actual function and true significance of these colossi, which are thought to date back to the early centuries of the Christian era, are still a mystery, but they are not a novelty in the Pacific region. They are also found on other islands and are probably monuments dedicated to ancestors* (tiki). *Later migrations of peoples who clashed with the original Polynesian population initiated a period of political, social, and cultural decline and the end of moai art.*

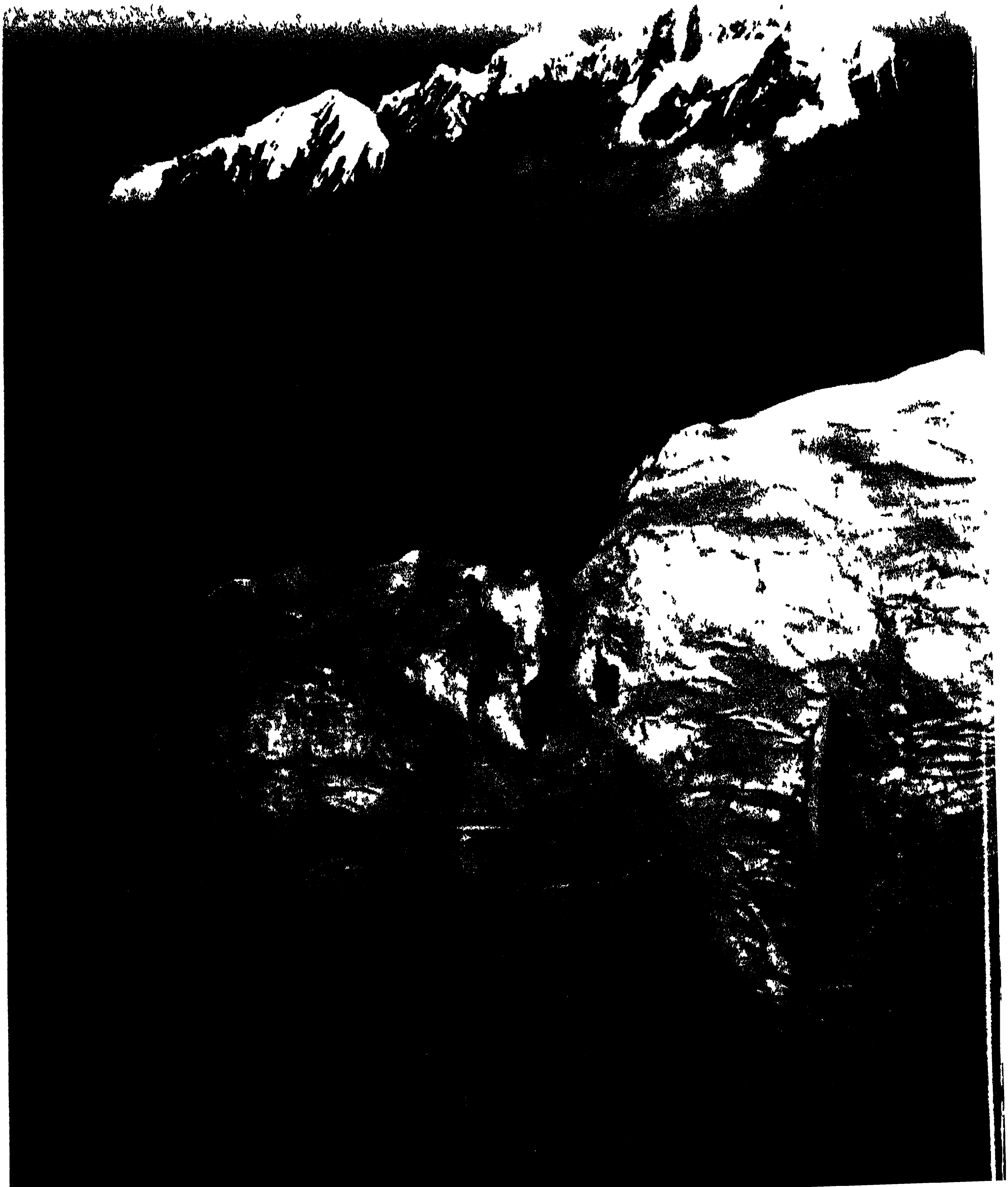
47. *An ornamental frieze in the sculptural style of the ancient Maori. Maori sculpture, which has an essentially functional as well as decorative value, exhibits extraordinary technical virtuosity, particularly in bas-relief work. The human figure is frequently depicted, either alone or in groups, and often stands out against a background of carved and open-work curvilinear motifs. The characteristic faces show large mouths with the upper lip strongly accentuated and pointed at the center, almost like a bird beak.*

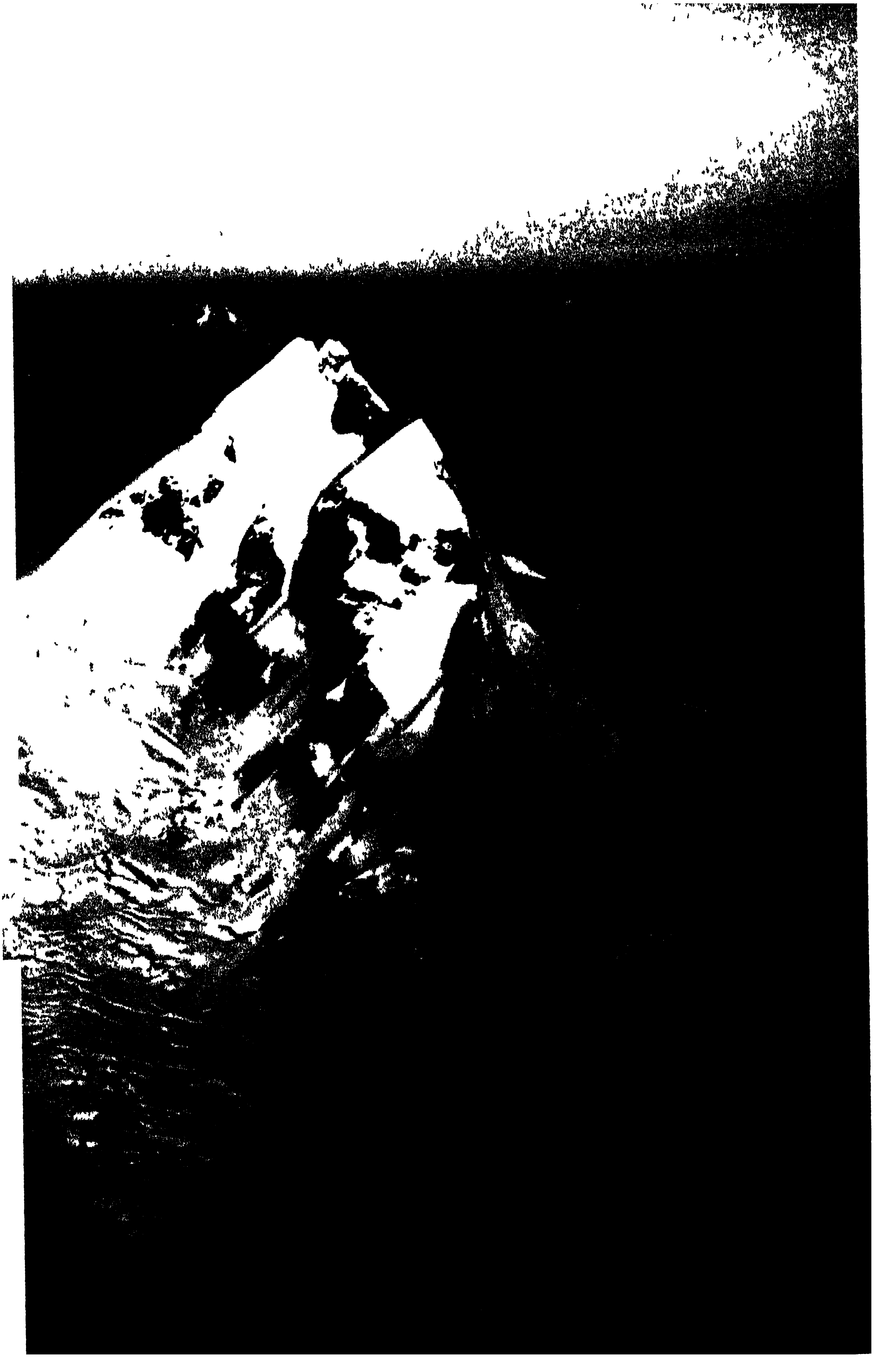
48. *A Maori totem. From an artistic viewpoint the Maori have developed an autonomous body of work; beginning with the typical premises of ancient east–central Polynesian art, they have arrived at highly ornamental and distinctive creations that can be divided into three genres: figures in the round, ornamental friezes, and carved prows and sterns of dugout canoes.*

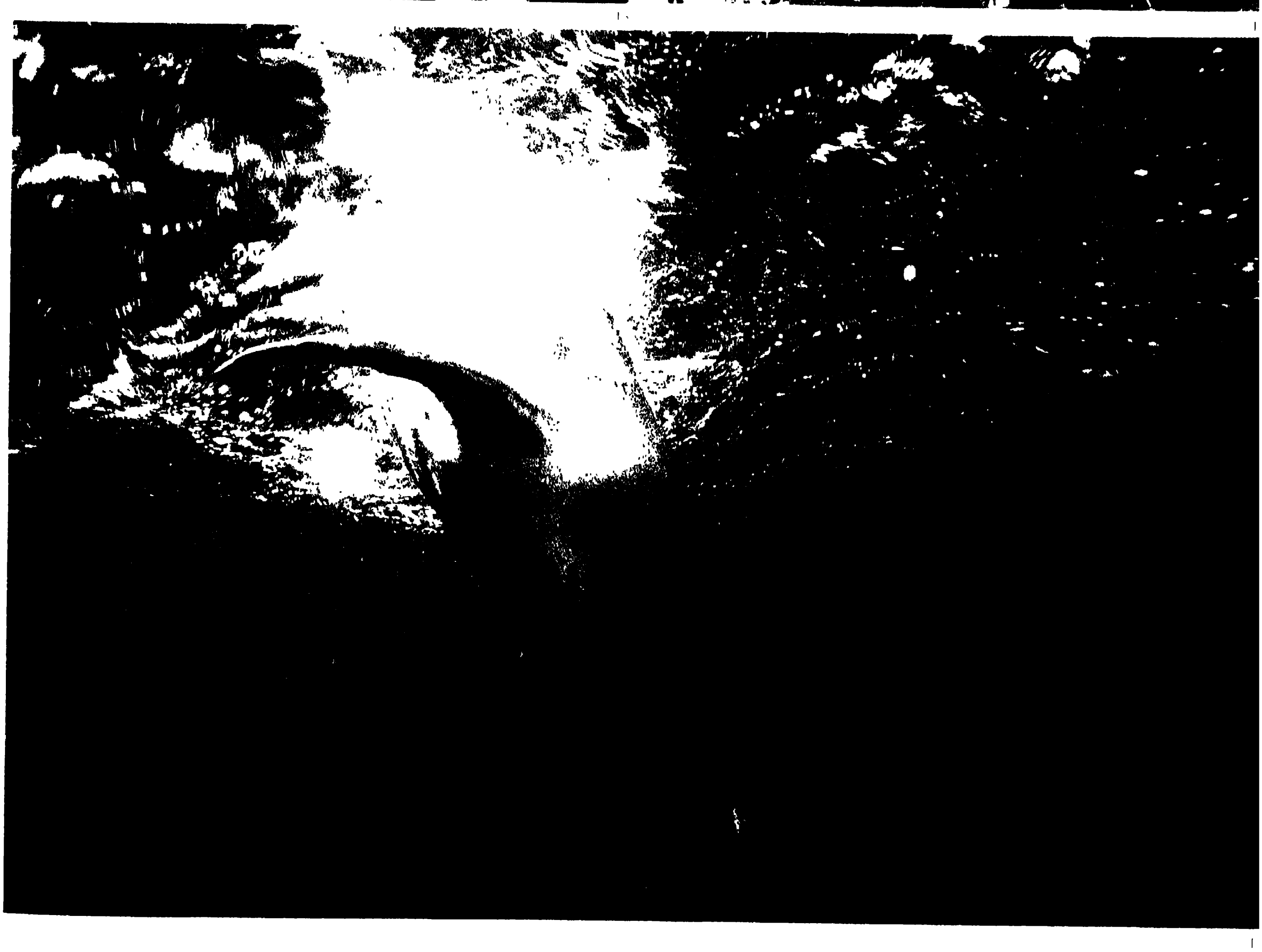
49. *A group of Maoris performing the* haka, *a traditional dance with a vigorous rhythm punctuated by clapping hands and accompanied by elementary dance movements. Warrior epics find their natural expression in the emphatic and declamatory style of the haka, with shouts and claps used to intimidate the adversary and instill courage in the Maori warriors, urging them to attack without hesitation, sure of divine protection. The ancient music of the Maori consisted almost entirely of* waiata, *songs without instrumental accompaniment and subdivided according to ritual and social function.*

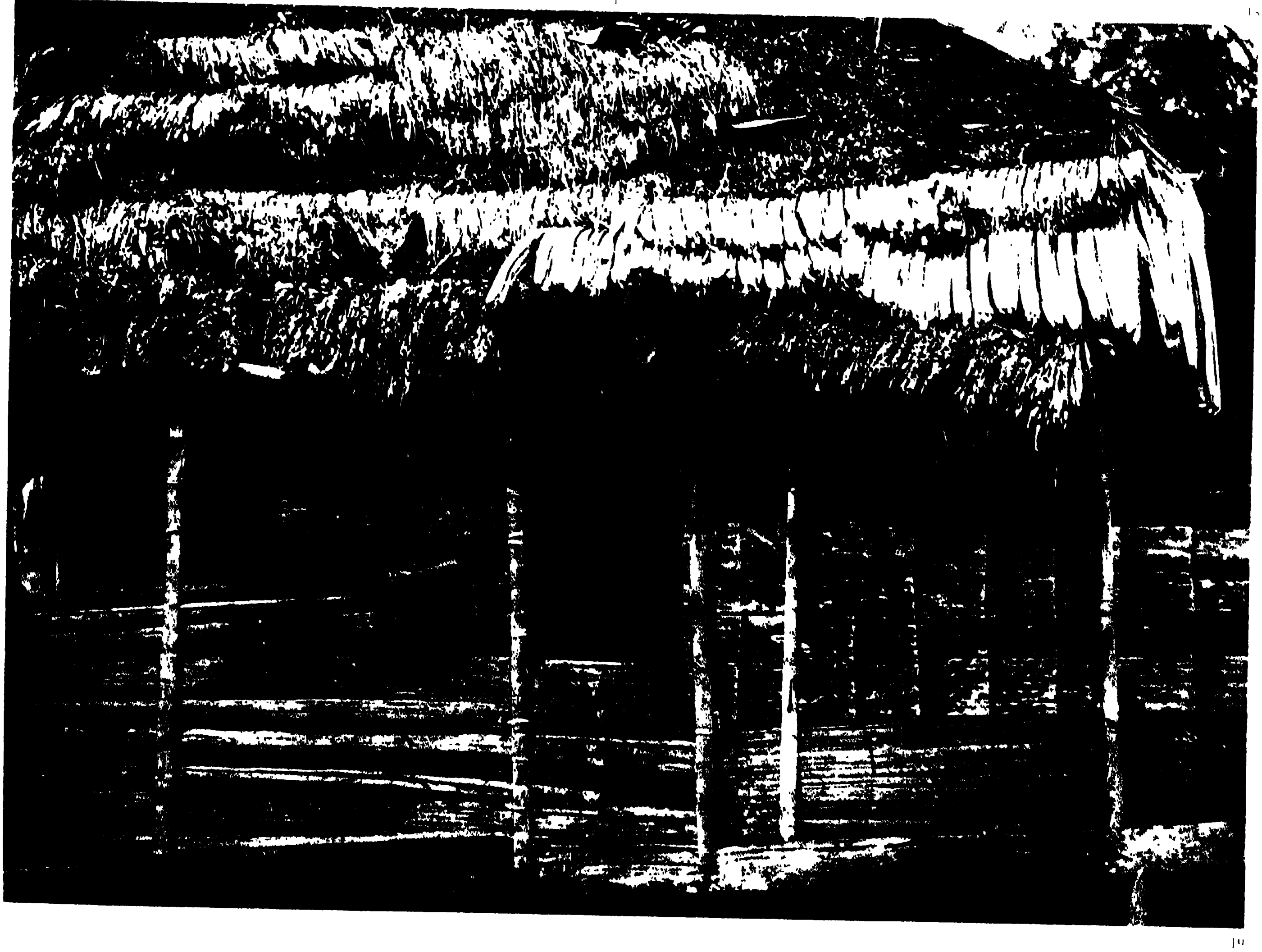
50. *An evocative sunset rendition of the* hula, *a traditional dance performed in Hawaii, celebrating the island's attainment of statehood in the U.S., which officially occurred in 1959. The hula, the highest musical expression of the Hawaiian people, is now known the world over; the dance is communicated in characteristic rhythms, to the accompaniment of folk string and percussion instruments. It is performed at all private and public festivals of Hawaiian folklore.*

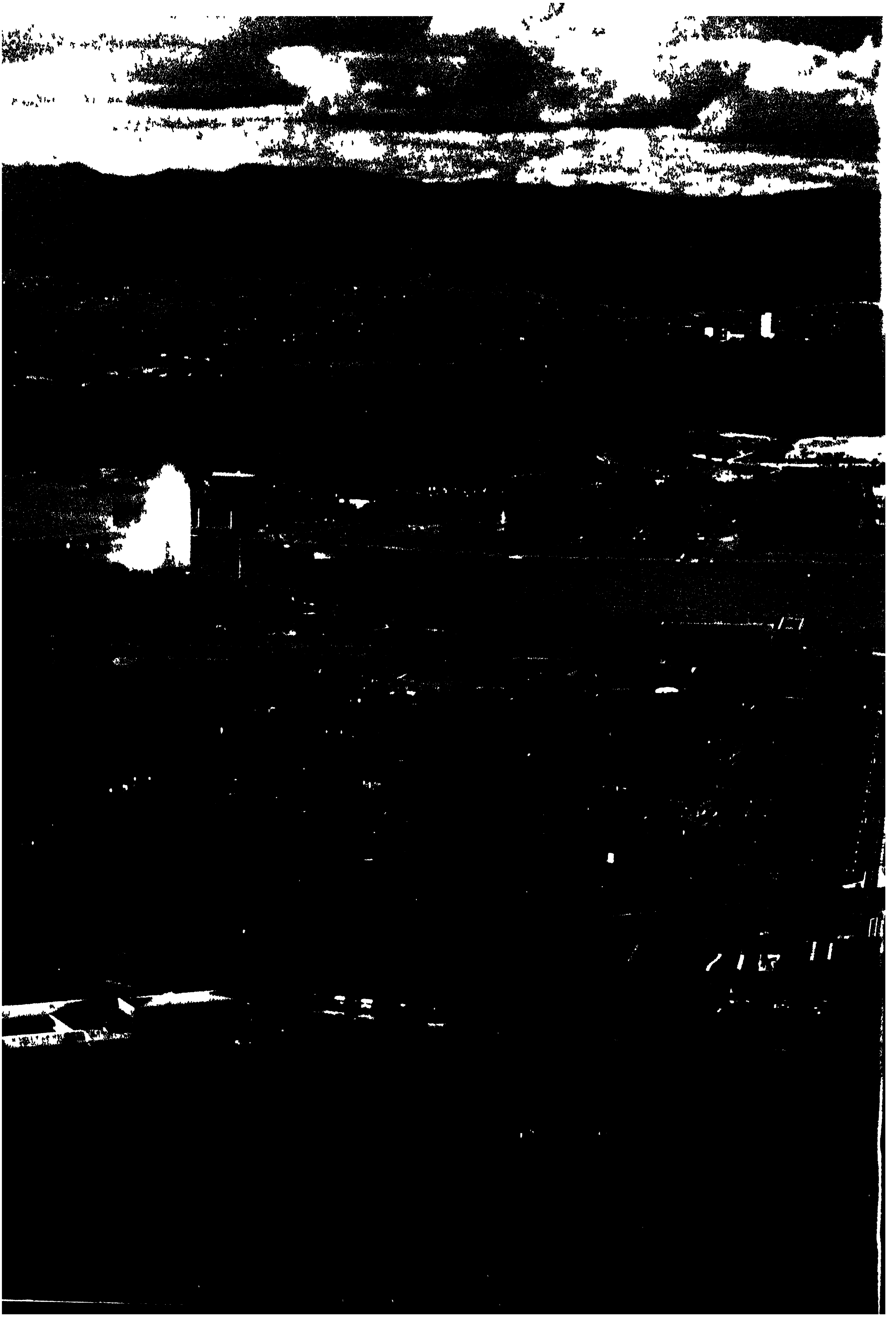
51. *A ritual mask carved out of white wood from the Sepik river region, the area of New Guinea with the richest artistic heritage. Polychrome masks, almost always executed by professional artists, are made for rituals in which the living participate in the world of the dead and carry reliquaries that contain the skull of the deceased, considered the center of the life-force. It is rather difficult to establish clear differences among the styles of the various tribes dwelling along the river, since objects are commonly traded in order to further enrich local ceremonies, indirectly causing the absorption of foreign elements into individual local traditions.*

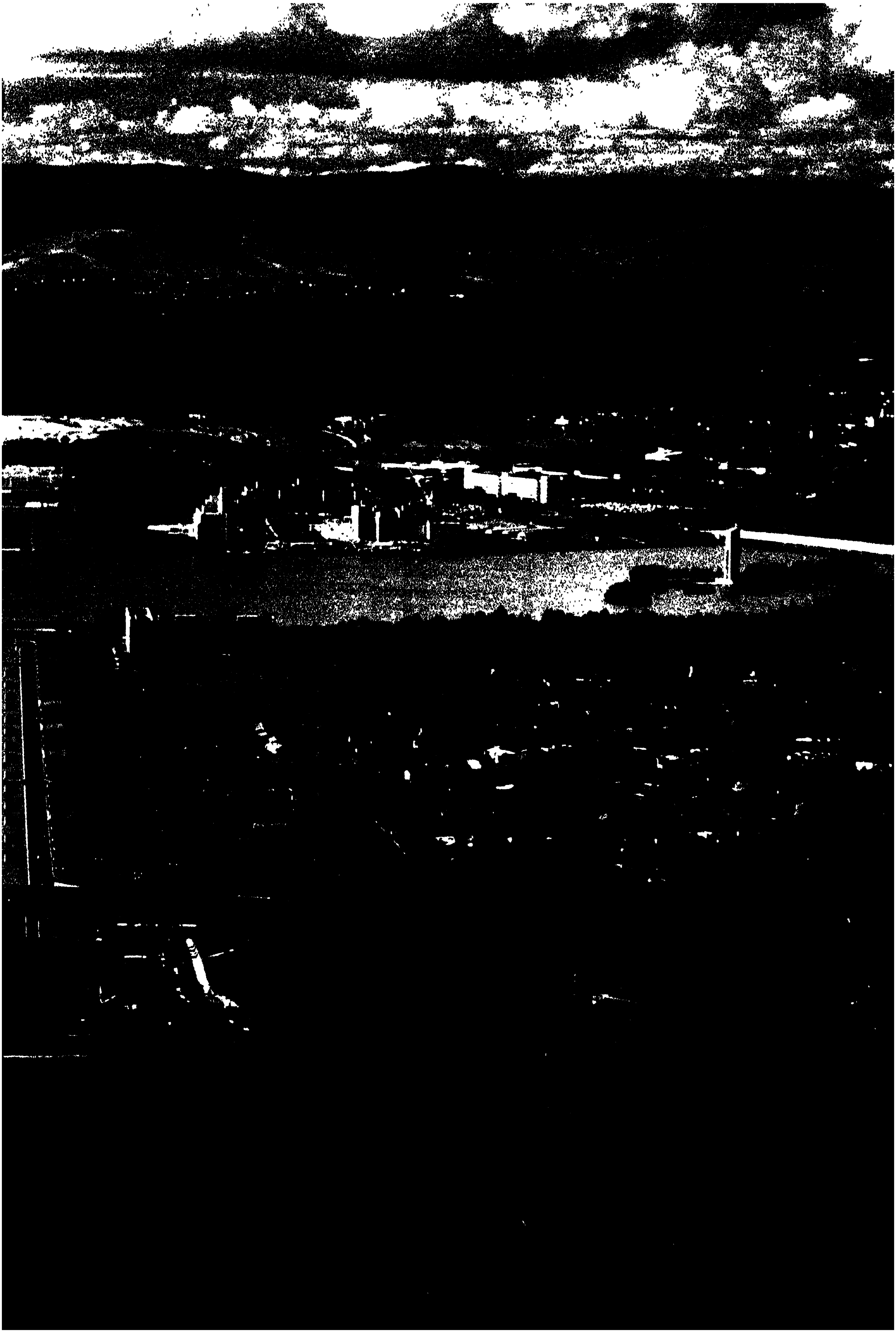


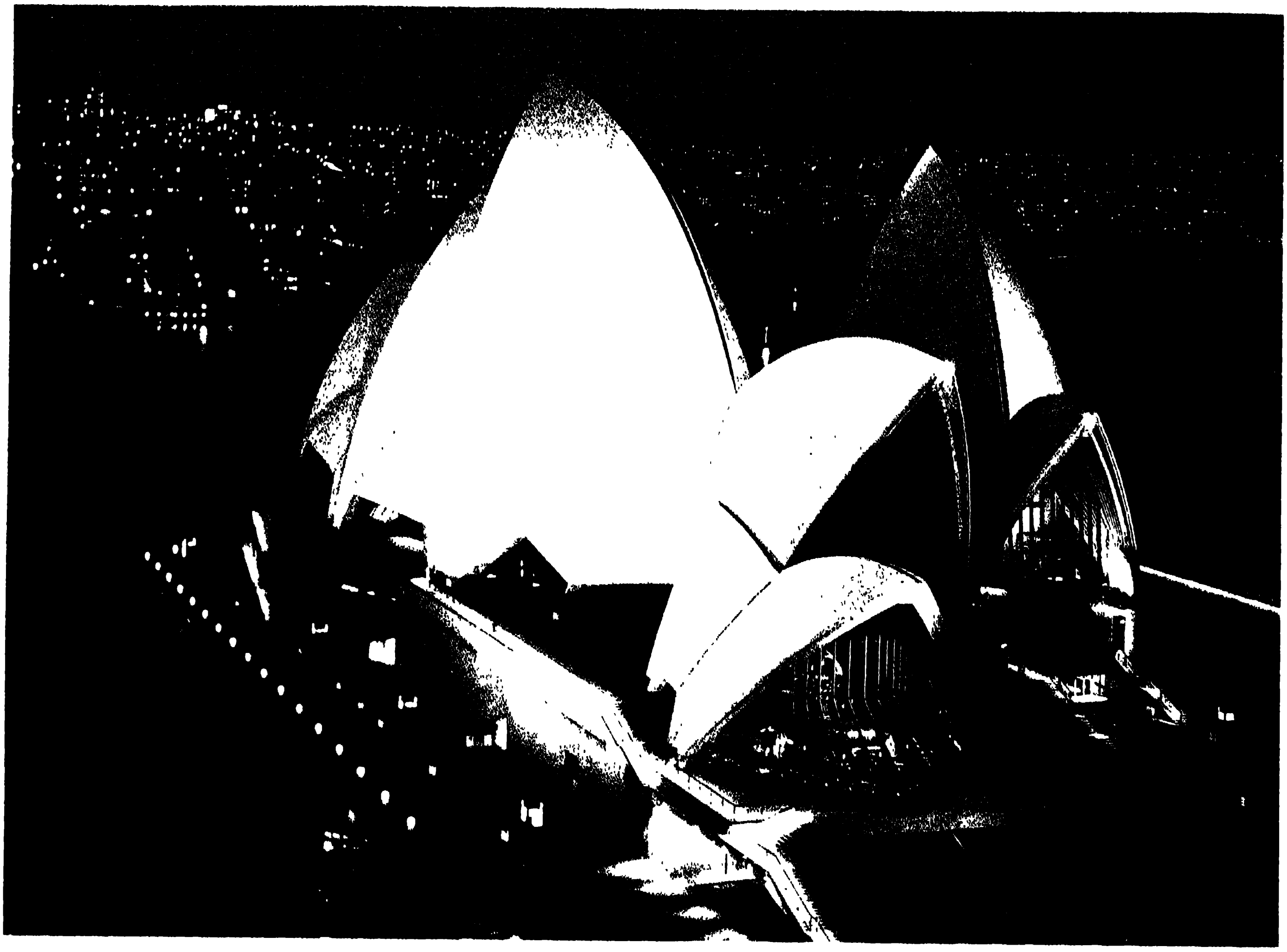


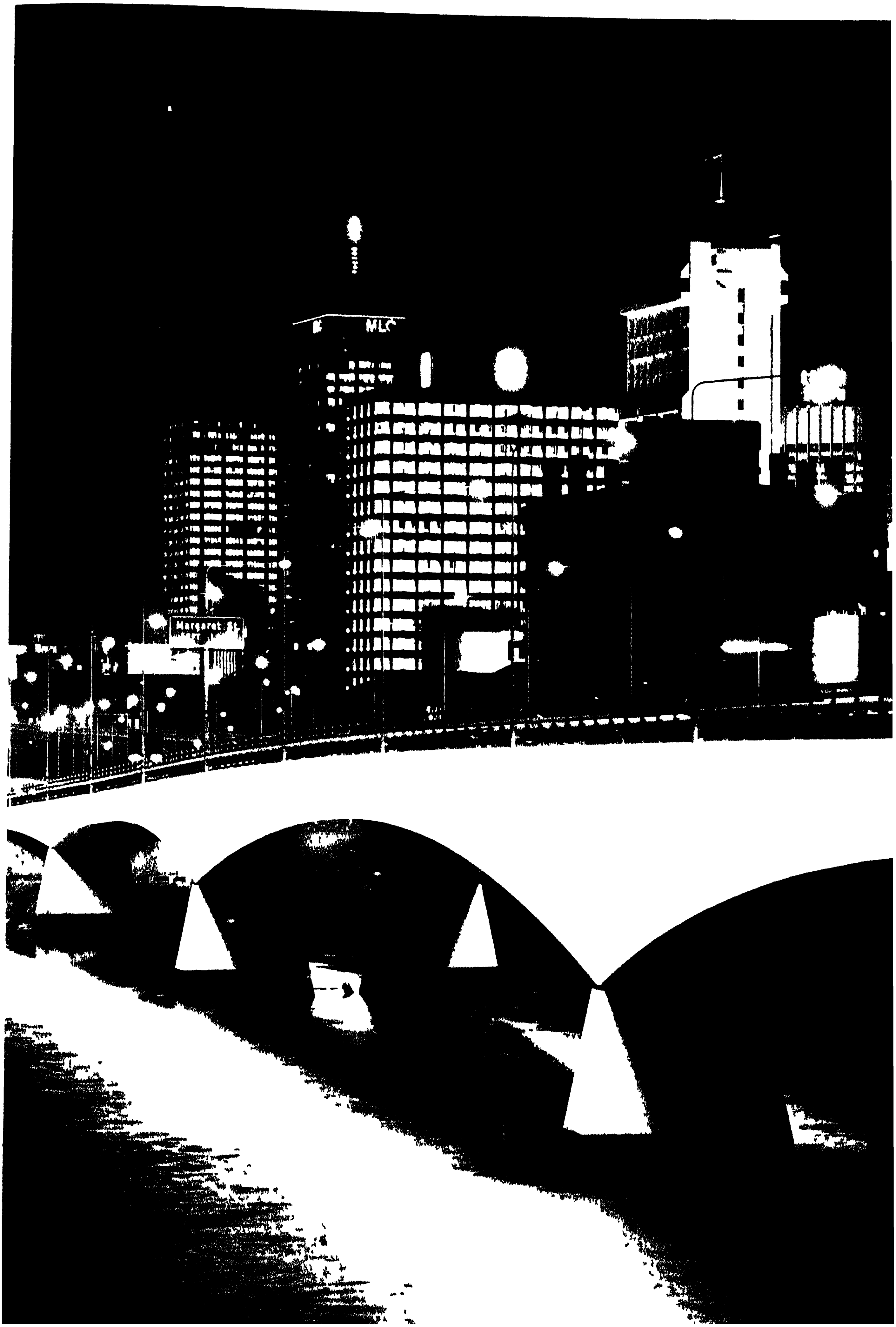












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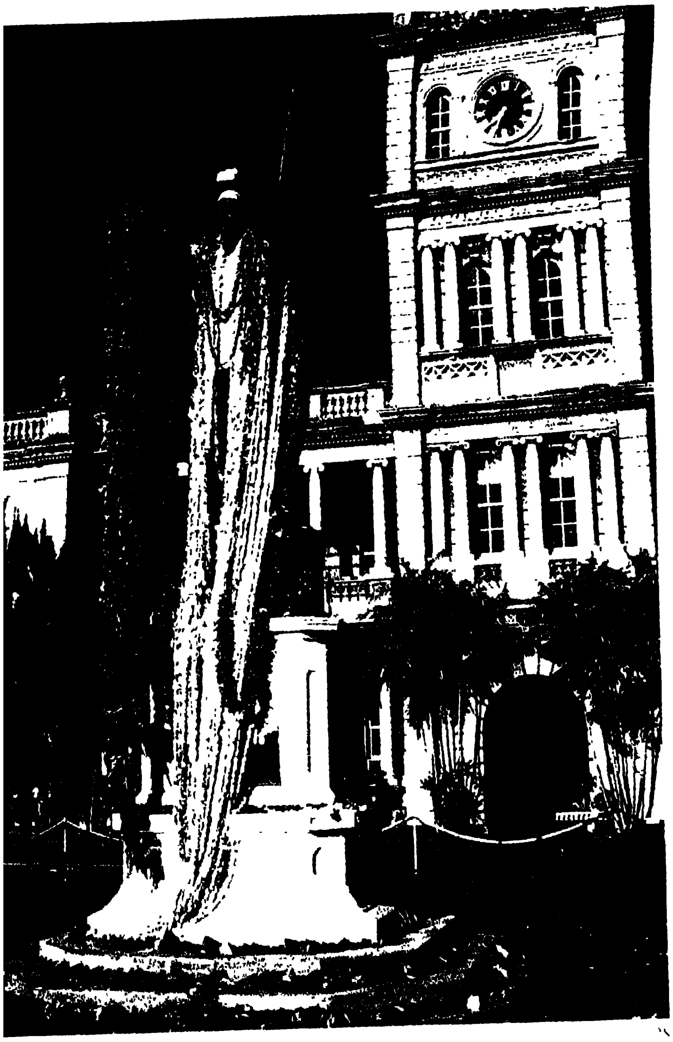

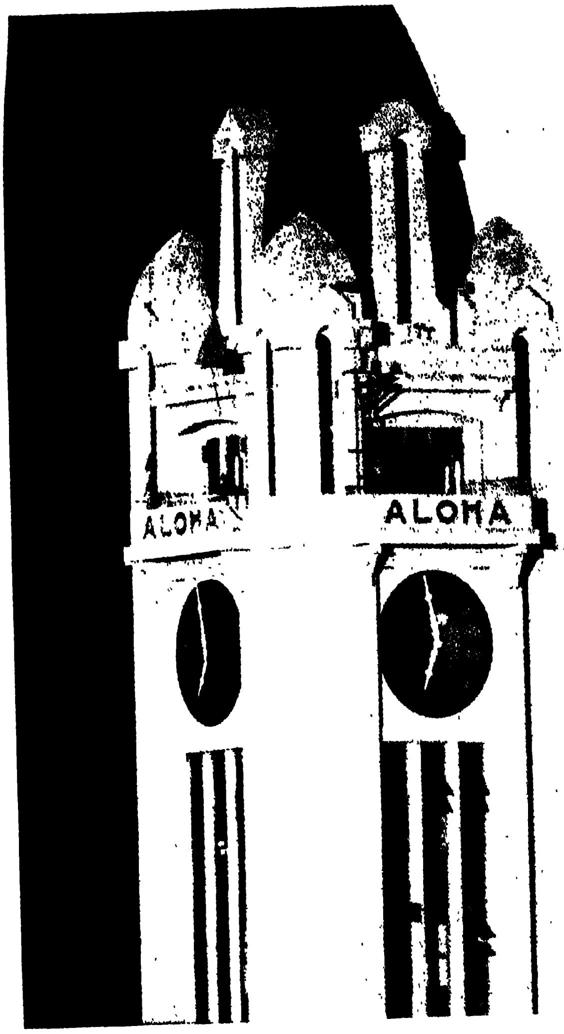
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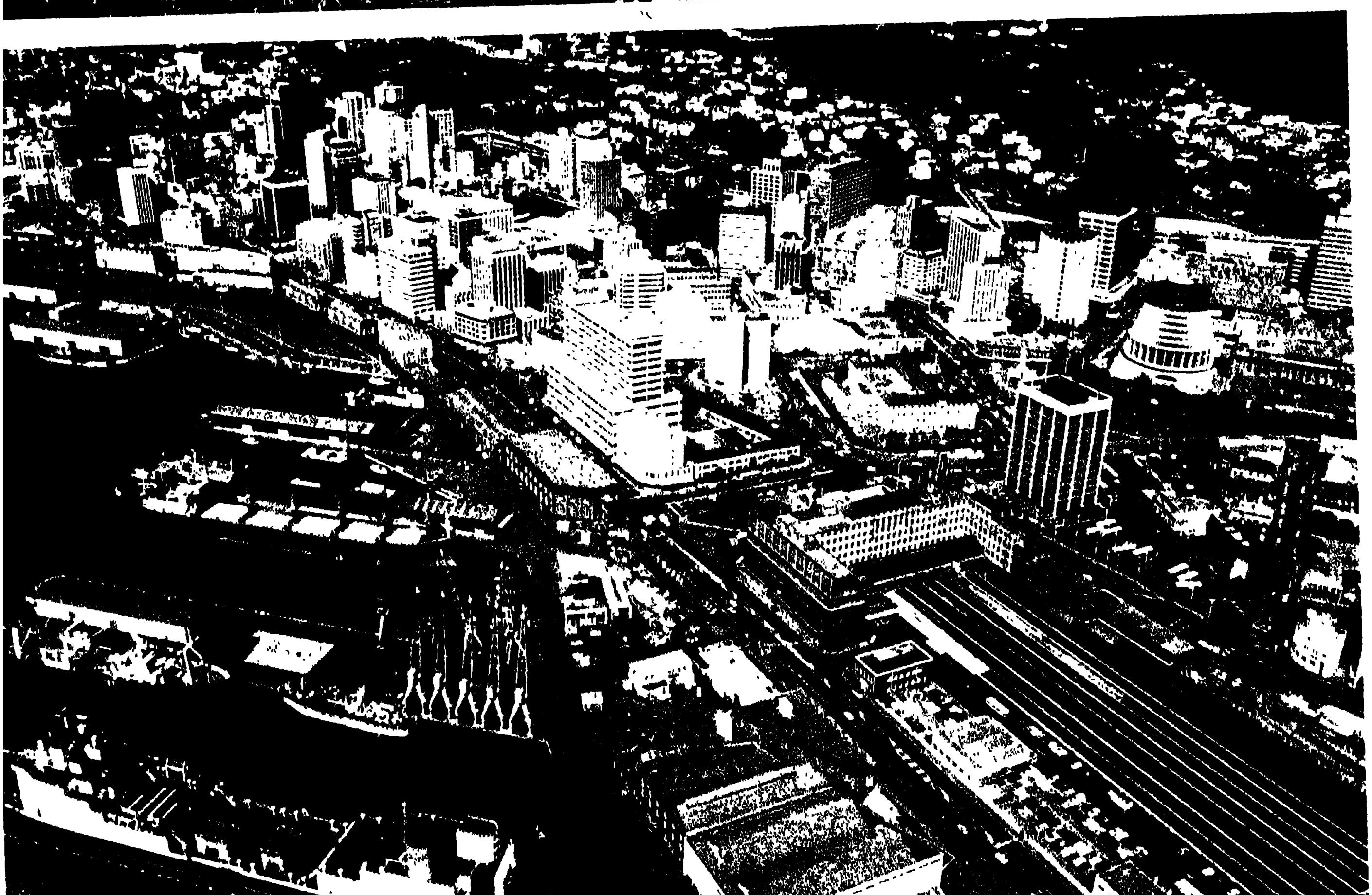

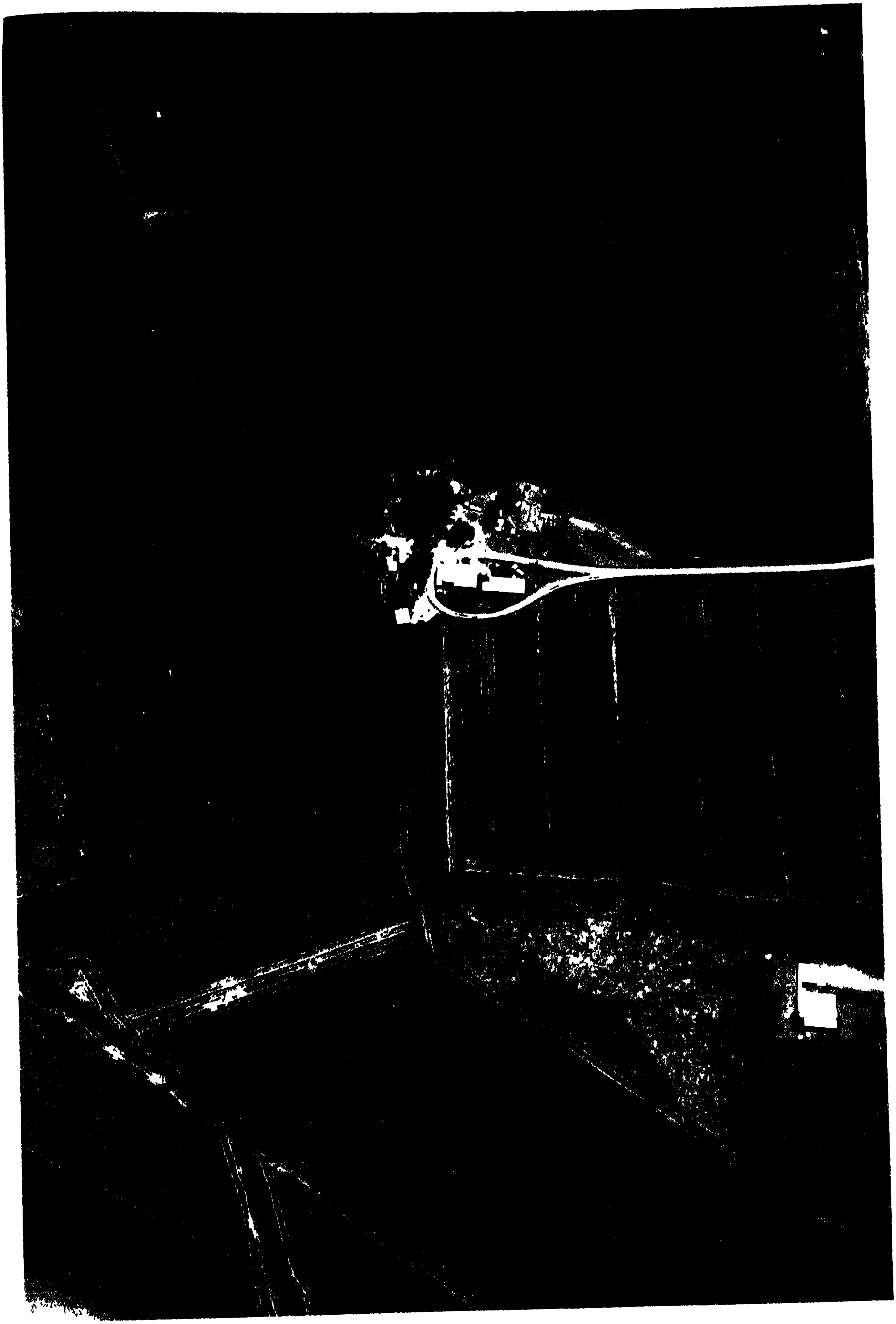

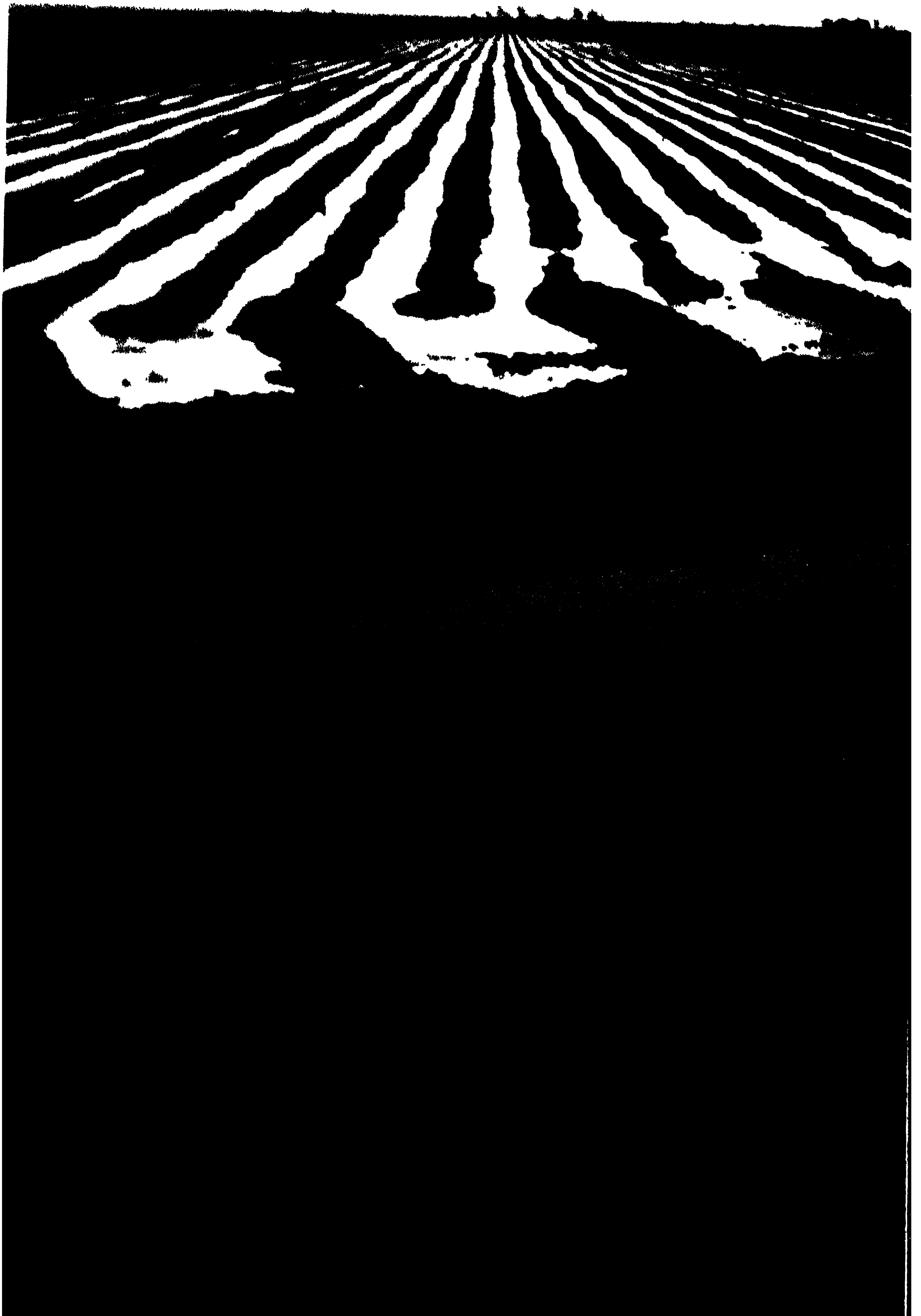

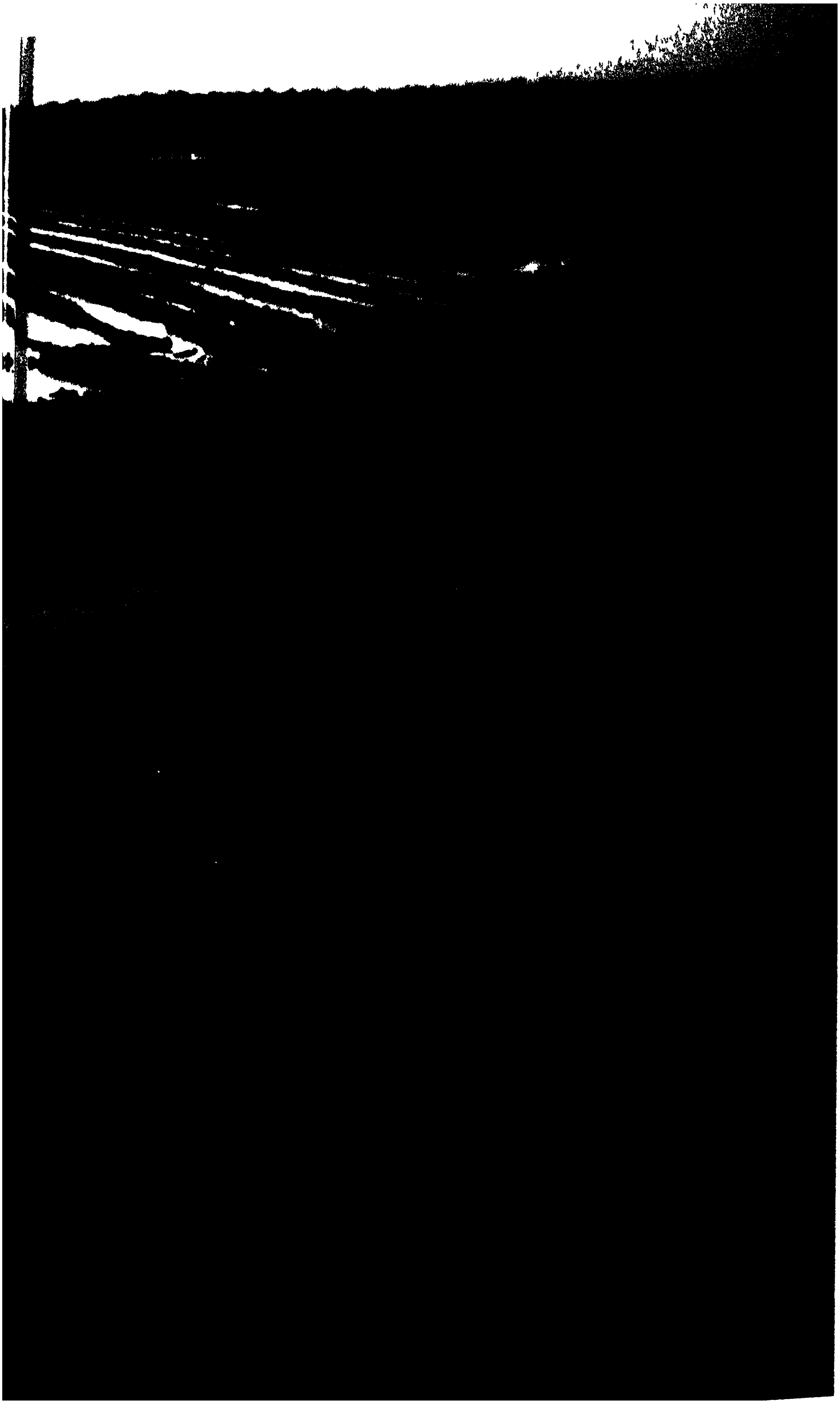

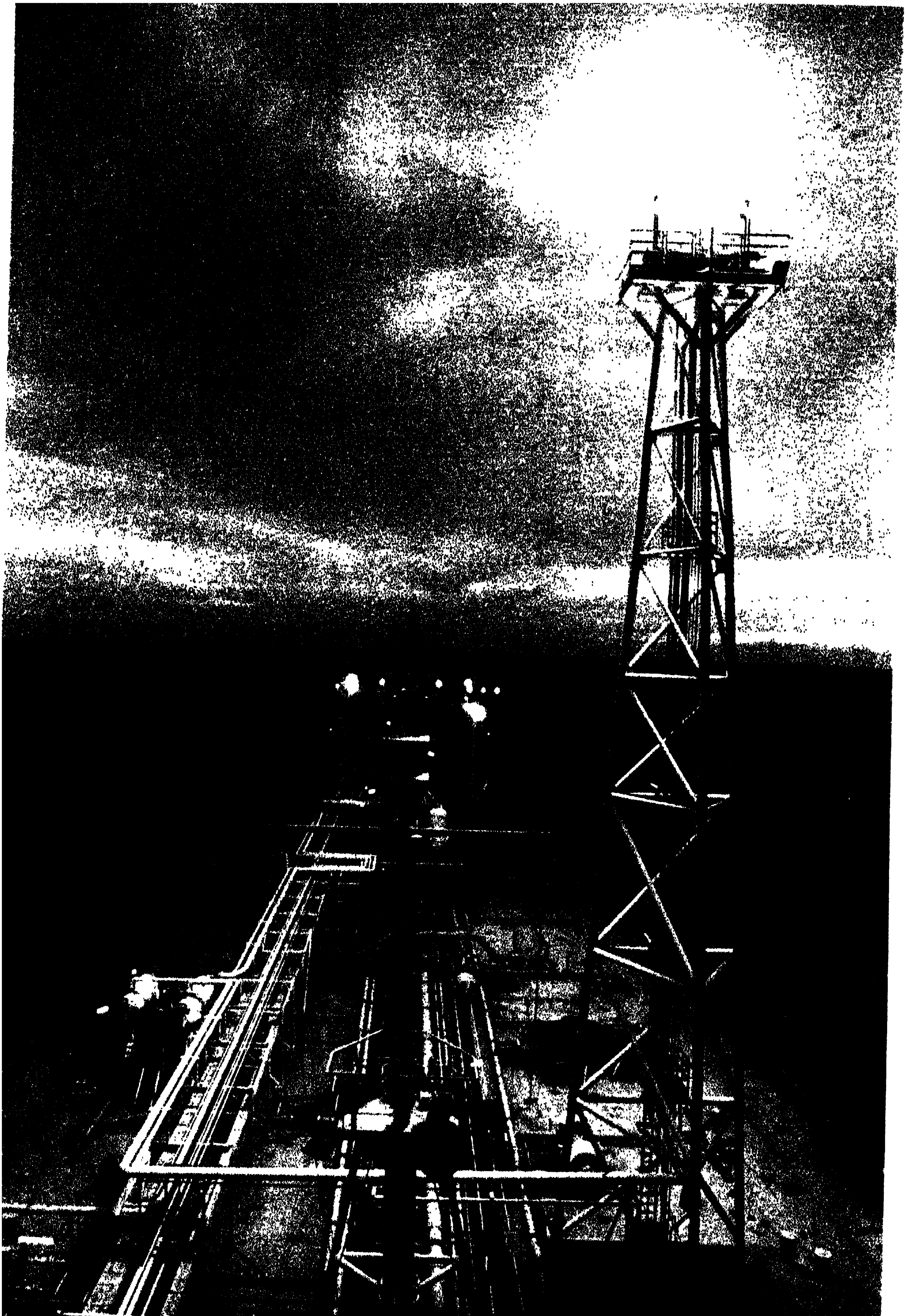

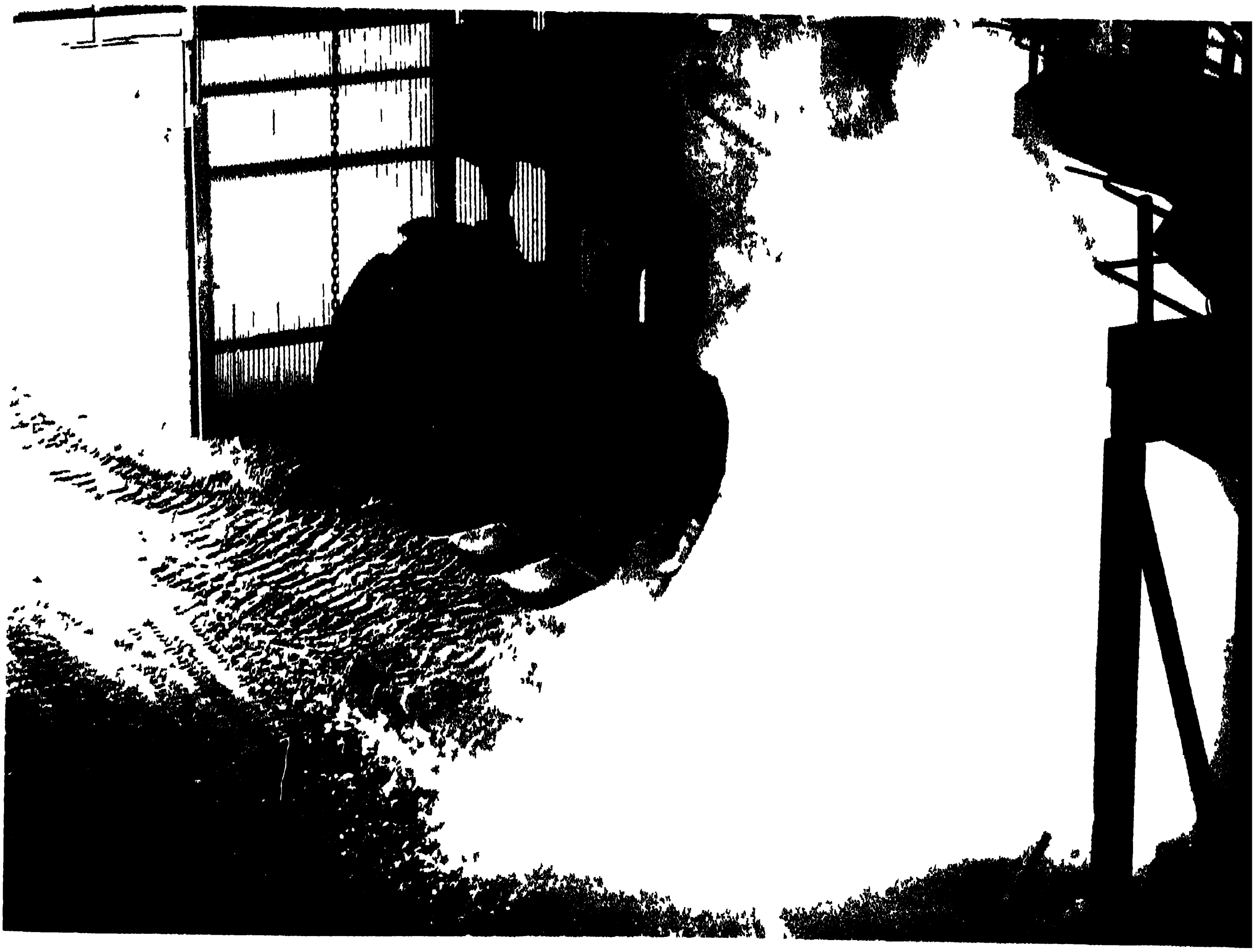

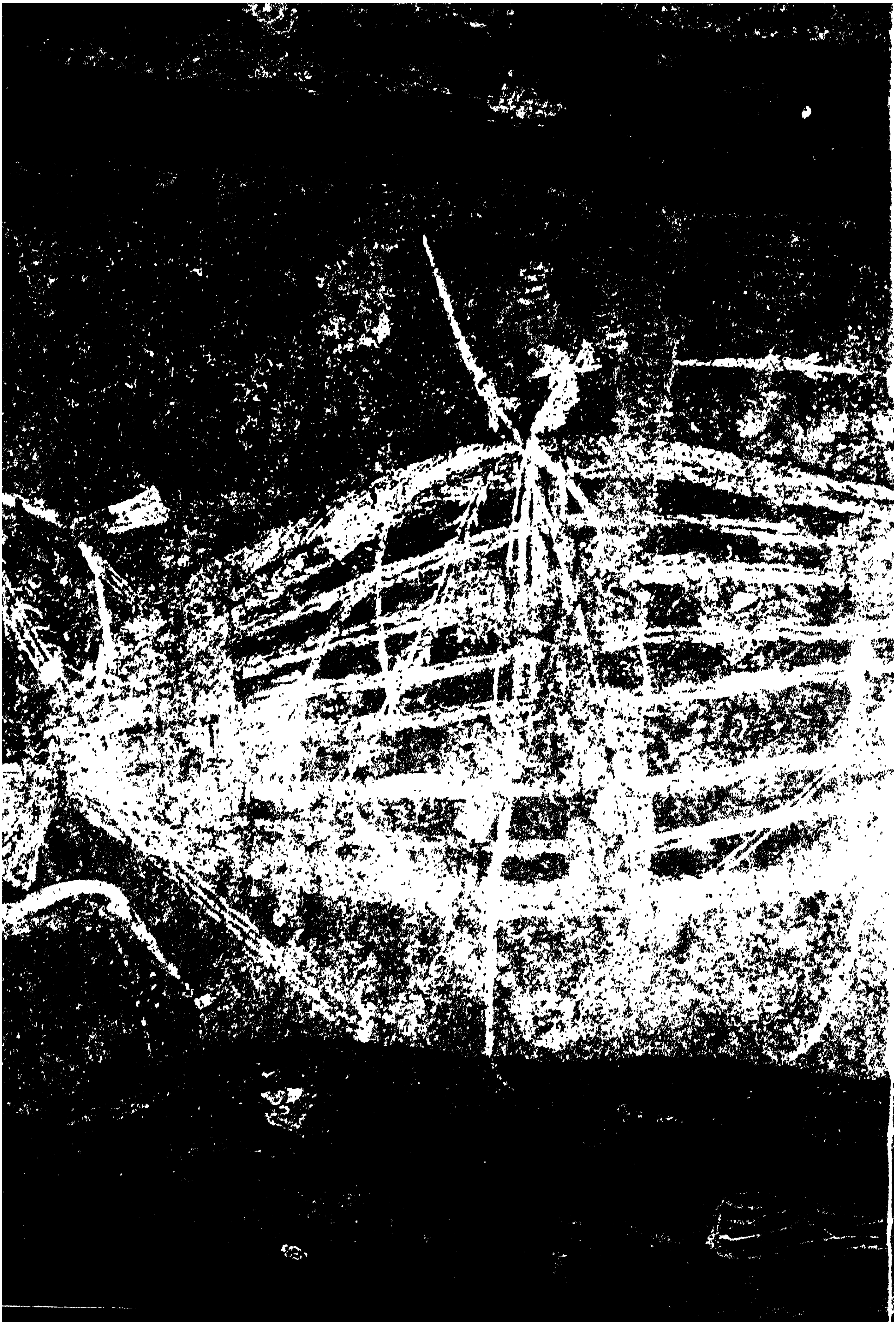

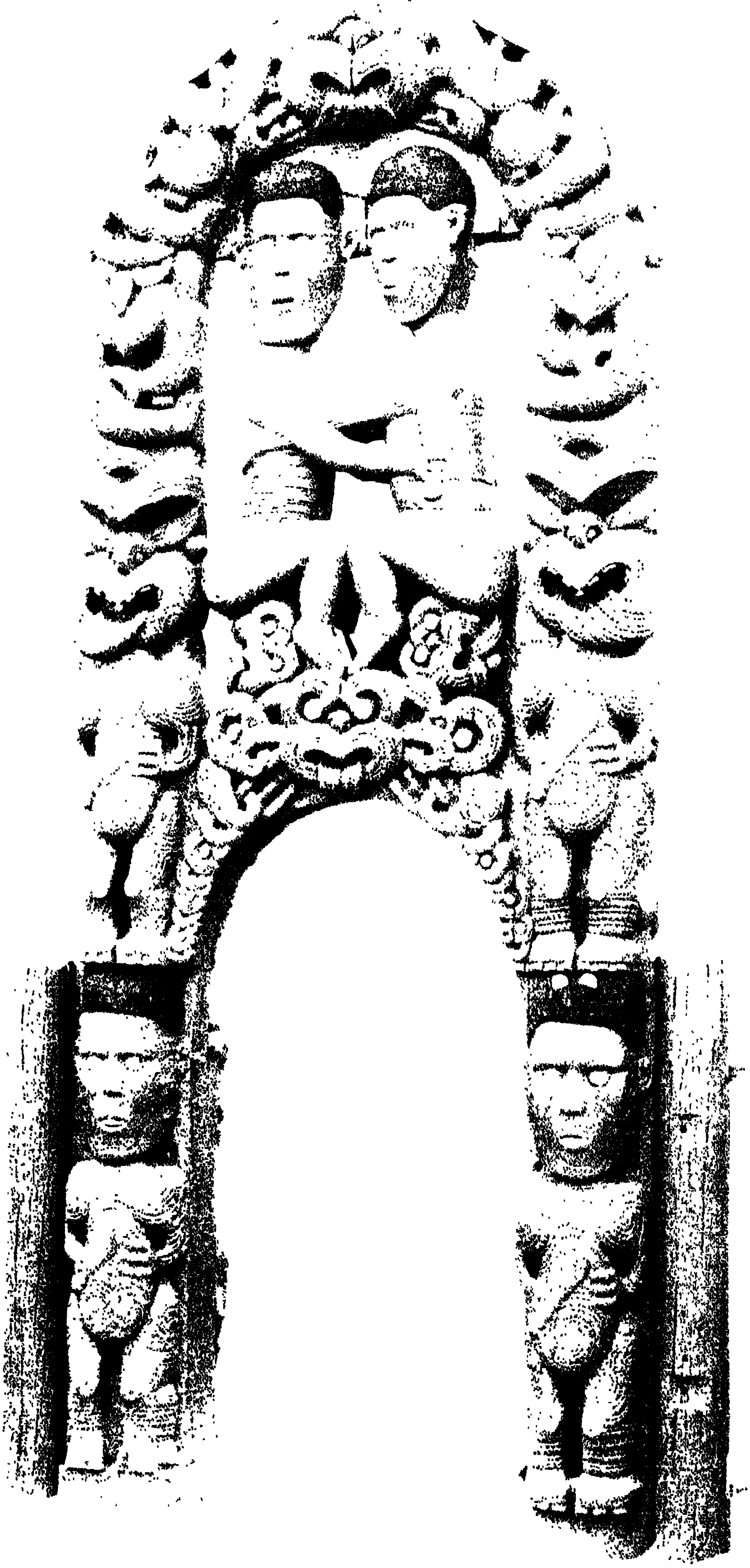

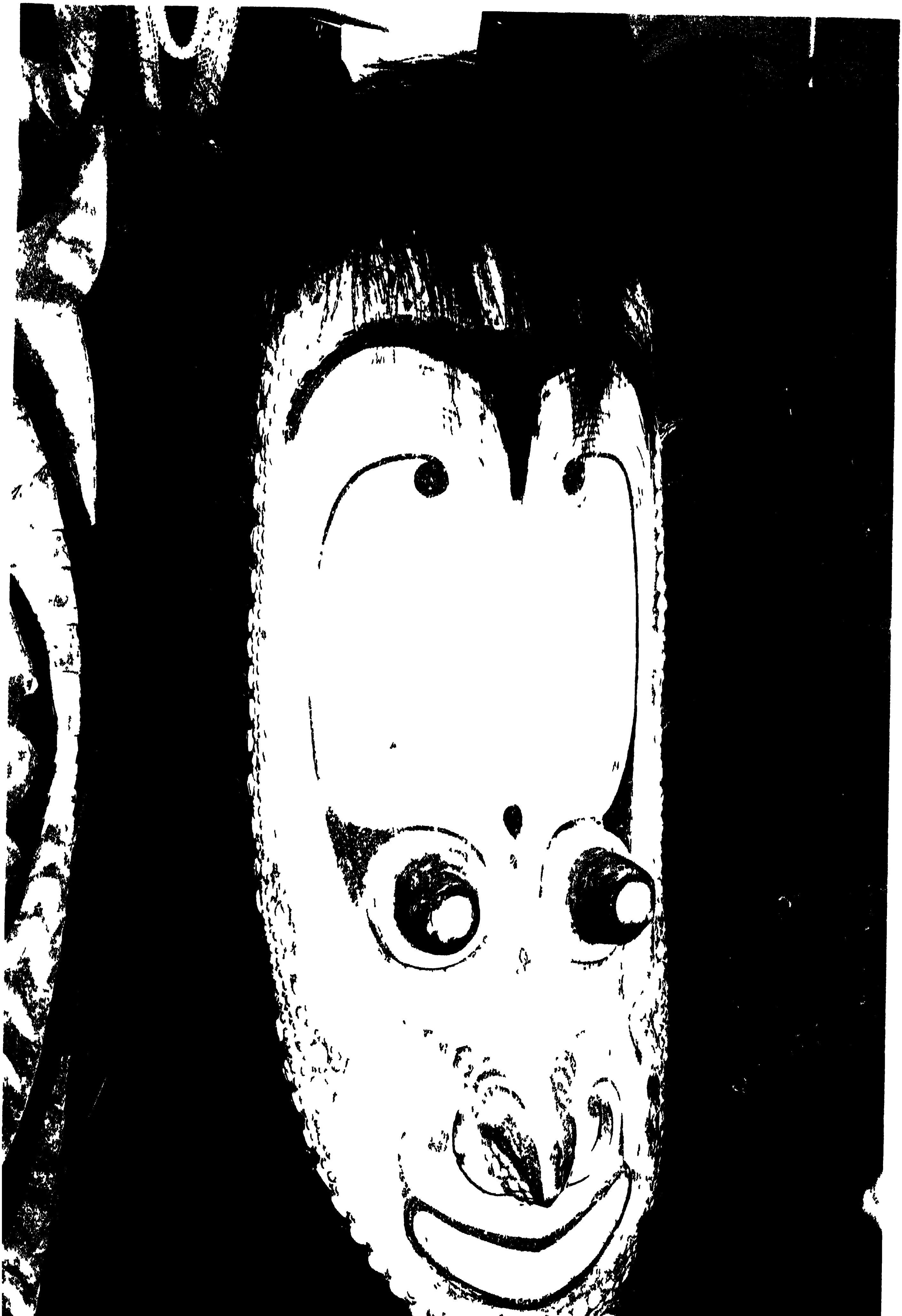

Polar Regions

The Arctic and Antarctic—the two opposing polar regions—surely have an evocative appeal equal to, or perhaps greater than, that exerted by other places on Earth such as "darkest Africa," the "mysterious East," the Amazon rainforest, or the South Seas. There is no other explanation for the tenacious persistence of those who have explored these regions, blazing new trails and confronting extremely harsh environmental conditions. The fascination with the poles has claimed many victims since the beginning of their explorations. What these explorers venturing among the icy darkness of the polar nights were seeking, and what they felt, is something we can only imagine and experience vicariously by reading the accounts of their travels.

THE ARCTIC

The word "Arctic" is derived from the Greek *arktos*, "bear," referring to the constellation of Ursa Minor containing the Pole Star, which appears to lie on a line extended from the Earth's axis of rotation. The Arctic as a geographic entity involves very specific environmental, and especially climatic, conditions. It is climate, after all, that identifies the size and external characteristics of the north polar cap. Some scholars place the boundary of the Arctic along the line followed by the 50°F [10°C] isotherm for the month of July. This also marks the approximate northern limit of tree growth. Others, however, prefer to place the borders of the Arctic region along the 32°F [0°C] annual isotherm, which coincides fairly well with the limits of perennially frozen ground (permafrost). Still others believe that any point at which the mean temperature for the warmest month does not exceed 54°F [12°C] lies within the Arctic Zone.

Depending on these definitions, the area of the Arctic polar region is between 8 and 10 million mi^2 [21–27 million km^2]. In practice, it includes the extreme northern reaches of North America, Europe, and Asia, including Iceland, Greenland, the Canadian Far North (with Baffin, Ellesmere, Victoria, Banks, and many other islands), northern Alaska with the Brooks Range, the Aleutians, the archipelagoes of Svalbard, Franz Josef Land, Novaya Zemlya, and Severnaya Zemlya, the New Siberian Islands and others that lie within the Arctic Ocean, and lastly the Taimyr and Chukchi peninsulas and the entire vast Russo-Siberian continental shelf with the mouths of the Pechora, Ob, Yenisei, Lena, and Kolyma, and the other rivers which flow into the Barents, Kara, Laptev, and Eastern Siberian seas.

The Arctic Ocean. The Arctic Ocean can be regarded as a continuation of the North Atlantic; there is no actual boundary between the two except that of climate or the average southernmost limit of icebergs, although it could be artificially delimited by the Arctic Circle (66° 33' N latitude). The Arctic Ocean is therefore enclosed within the northern coasts of Asia, Europe, and North America. Its total area can be estimated at about 5.7 million mi^2 [14.8 million km^2].

The coastline is extremely complex, dotted with archipelagoes and islands that define a number of inland seas: the Chukchi Sea between Alaska and Eastern Siberia; the Beaufort Sea between Alaska and Banks Island; the Lincoln Sea between Ellesmere Island and Greenland; and the Barents Sea between Svalbard, Novaya Zemlya, Franz Josef Land, Norway, and the European coast of Russia. The Kara Sea, between Novaya Zemlya and Severnaya Zemlya; the Laptev Sea, between Severnaya Zemlya and the New Siberian Islands; and the East Siberian Sea, between the New Siberian Islands and Wrangel Island, all lie off the Asiatic coast of Russia. The volume of water in the Arctic Ocean is estimated at 4.1 million mi^3 [17 million km^3].

The sea floor is characterized by a long ridge (Lomonosov Ridge) that extends from the New Siberian archipelago toward the pole and then toward Ellesmere Island. It is probably related to the great Mid-Atlantic Ridge. The Arctic Ocean reaches its greatest depth (over 18,000 ft [5500 m]) between this ridge and the Svalbard, Franz Josef, and Severnaya Zemlya islands, in a wide basin with an average depth of more than 13,000 ft [4000 m]. The sea floor at the pole itself lies at a depth of 13,405 ft [4087 m].

Most of the Arctic Ocean is covered with surface ice, in the

form of a permanent "pack" that, in winter, extends seamlessly to the land masses which lie around the Arctic basin. At greater depths, although the temperature is slightly below freezing (30.6–31.3°F [–0.8 to –0.4°C]), the seawater remains liquid because its salt content lowers the freezing point. The average thickness of Arctic pack ice is about 10–20 ft [3–6 m]. At certain intervals it breaks up into large floes which are then carried along by surface currents. During the summer, the southern limit of the Arctic pack ice extends from the east coast of Greenland, touches the Svalbard Islands (80° N latitude) and Franz Josef Land, and links the New Siberian and Severnaya Zemlya groups. It then runs along Wrangel Island and skirts the North American coast at a distance of about 190 mi [300 km], joins Parry Island to Ellesmere Island, and closes the circle again at Greenland.

The absence of pack ice during the summer months off Europe's northern coast is due to the Gulf Stream, which raises the water temperature just enough to prevent freezing. Other surface ocean currents circulate in distinct patterns in the central area of the Arctic basin and the Beaufort Sea, while another current runs between Greenland and Baffin Land toward more southerly latitudes, feeding the cold Labrador Current.

In summer, the southern limit of the icebergs that become detached from the Arctic pack ice is essentially identical to the 50°F [10°C] isotherm for the month of July (which lies south of the Aleutians and Greenland), and even at the North Pole the temperature is only a little below freezing. In winter, however, temperatures are extremely low throughout the region. At the geographic pole it can be –40°F [–40°C], while in northeastern Siberia and interior Greenland, the temperature can even drop below –58°F [–50°C]. Diurnal temperature variations, however, are generally very small. East and southeast winds lash the frozen wastes for almost the entire year, slackening only in the summer months, when they are replaced by persistent fog caused by outliers of warm air masses from lower latitudes.

Greenland. Politically, Greenland (Kalaallit Nunaat) is a province of Denmark; since 1979 it has been granted substantial autonomy, with its own government and legislative assembly. Like the Færøe Islands, it is represented by two deputies in the Danish parliament. With an area of 839,780 mi^2 [2,175,600 km^2], it had a population of 49,630 in the 1976 census, and an estimated 55,000 in 1991.

In physical terms, Greenland is considered the world's largest island; it consists of a large fragment of the North American continent, surrounded by a dense band of smaller islands, and lies between 59° 46' (Cape Farvel) and 89° 39' N latitude (Cape Morris Jesup), with a total length of almost 1900 mi [3000 km] and a width that often exceeds 600 mi [1000 km].

Geologically, it consists of a basement of ancient igneous rocks related to the structure of the Canadian Shield and partially covered by more recent (Mesozoic and Cenozoic) volcanic and sedimentary materials. Almost all of Greenland's land area (707,885 mi^2 [1,833,900 km^2], or 84%) is covered by an ice cap averaging 5000 ft [1500 m] thick, with portions that are 6500 ft [2000 m] or even 10,000 ft [3000 m] deep. It is a relic of the ice sheet that covered much of North America and northern Eurasia until about 10,000–12,000 years ago. Below the ice cap, Greenland's surface topography has only modest relief, with the exception of the marginal regions where craggy mountains often exceed 10,000 ft [3000 m] (Forel, 11,020 ft [3360 m]; Gunnbjørn Field, 12,135 ft [3700 m]).

Greenland's coastline is highly indented, and its coastal mountains (whose summits, emerging from the ice, are called *nunatak* by the Eskimos) are also extremely complex, in both cases because of the intense erosive action of the glaciers which descend from the edges of the ice cap into the sea, where their tongues fracture into huge blocks. These icebergs, floating on the cold ocean waters, are often transported far to the south by ocean currents such as the Labrador Current, constituting a serious hazard to navigation.

Climatic conditions in Greenland are distinctly polar, both because of its geographical position but most of all because of its thick covering of ice. The temperatures in the interior (which is also scourged by violent windstorms) are among the lowest found anywhere on Earth (–4°F [–20°C] on average, but with minimums as low as –58°F [–50°C]). The coastal regions, however, due in part to the influence of ocean waters (several branches of the warm Gulf Stream strike the eastern shores), have substantially higher temperatures, with average July temperatures several degrees above freezing. Precipitation, generally in the form of snow, is fairly sparse in the interior, but can exceed 40 in. [1000 mm] per year on the southern coast, with greater frequency in autumn and winter. The coasts are therefore covered with typical Arctic tundra vegetation, with mosses and lichens but also meadows and isolated groves of broadleaf trees (beeches), perhaps the remains of a much more extensive forest cover in earlier centuries, sufficient to justify the name given to this land by its first European discoverers.

Greenland's fauna, now rigorously protected, consists of large mammals such as polar bear, reindeer, and musk ox, as well as wolves, foxes, seals, and the like. The birdlife is fairly rich, and cod and salmon live in the coastal waters.

At present, Greenland is populated primarily by Eskimos; there has been considerable intermarrying with Europeans, but certain Eskimo groups have remained fairly intact, although their traditional ways of life have changed radically as a result of close contact with colonists and missionaries (generally Danes and other Scandinavians). Having abandoned their typical ice houses (igloos), they now live in modern villages located for the most part along the coast.

Economic activities consist principally of fishing (for cod and salmon) and hunting (seals), as well as livestock raising (reindeer and sheep). Greenland's mineral wealth, potentially extremely rich, has yet to be exploited on a large scale: coal, metal ores (lead and zinc), graphite, and cryolite are extracted.

Communications among the various coastal centers which include the capital, Nuuk, and Godhavn on the west coast; Julianehåb, Ammassalik, and Skjoldungen on the east coast; and with nearby Iceland and Denmark are provided by a coastal steamer service when the harbors are ice-free, and on a regular basis by airplanes and helicopters. The main international airport is Søndre Strømfjord on the west coast. A U.S. Air Force base is located at Thule (Dundas) on the northwestern tip of the island.

The European Arctic Islands. The sector of the Arctic Ocean north of Europe—consisting of a spherical triangle with a base covering 90° of longitude (from 20° W to 70° E) and two

sides converging toward the North Pole from 70°. N latitude—covers more than 1.5 million mi² [4 million km²] and contains a number of island groups that belong politically to Norway and to Russia, with the dividing line passing approximately through the 35° E meridian.

Norwegian dependencies include the small island of Jan Mayen (147 mi² [380 km²]) and the Svalbard archipelago (24,200 mi² [62,700 km²]). Located some 300 mi [500 km] northeast of Iceland and of volcanic origin, with activity evident as late as 1970 and mountains more than 6500 ft [2000 m] high (Beerenberg, 7,469 ft [2277 m]), Jan Mayen was discovered by Henry Hudson in 1608 and since 1929 has officially belonged to Norway (which in 1921 installed a radio and weather station on the island). A Loran station (1959) and Consol installation (1968) became operational there more recently.

The Svalbard archipelago, located 465 mi [750 km] north of Tromsø and lying between 74° 35' and 81° N latitude, comprises four large islands (Spitsbergen, 15,071 mi² [39,043 km²], Nordaust Land, 5485 mi² [14,210 km²], Edge, 1942 mi² [5030 km²], and Barents, 513 mi² [1330 km²]) and several smaller ones, including Bjørn, or Bear Island (69 mi² [179 km²]), which is the southernmost.

Discovered by Willem Barents in 1596, the islands have a very complex geological makeup, with an ancient crystalline basement covered by sedimentary deposits in a continuous succession from the Paleozoic to the Cenozoic. The archipelago's morphology derives mostly from glacial and marine erosion. Even today, a large part of the islands is covered by permanent ice, and numerous glaciers flow directly into the sea within deep fjords that cut into the coastline.

Climatic conditions are subpolar, characterized by windy and extremely cold winters (the mean temperature in January is normally below −4°F [−20°C]) and by the "polar night" which lasts from October to February. Summers, on the other hand, during which the sun never sets from April to August, are much milder, due in large part to the influence of the Gulf Stream; the average July temperature is approximately 43°F [6°C], but extreme highs of 68°F [20°C] have been recorded.

The vegetation consists of the characteristic Arctic tundra, while the fauna is extremely varied, with polar bears, reindeer, musk ox, Arctic hare, and fox. There is a particularly rich avifauna, consisting mostly of migratory species. In January 1989, the population of the archipelago was 3,646, comprising 1,055 Norwegians, 2,579 Soviets, and 12 Poles. The rich coal deposits (with confirmed reserves of approximately 9 billion tons) are exploited jointly by the Russians and the Norwegians, who in 1987 extracted a total of more than 990,000 t of coal, all of which was exported. The administrative capital of the islands is Longyearbyen (pop. 1100), the principal air and maritime port as well as the location of a radio weather station. The Norwegian Polar Institute operates a research station at Ny Ålesund.

The Russian and Siberian Arctic. Russia's island possessions in the Arctic Ocean cover a little less than 78,000 mi² [200,000 km²]. The largest ones consist of the archipelagoes of Franz Josef Land (6215 mi² [16,100 km²]) and Novaya Zemlya (31,885 mi² [82,600 km²]) in the European sector, and Severnaya Zemlya (14,500 mi² [37,560 km²]) and New Siberia (14,820 mi² [38,400 km²]) in the Asiatic portion, as well as smaller land areas such as Wrangel Island (2810 mi² [7280 km²]), the De Long Islands (300 mi² [780 km²]), Solitude Island (91 mi² [236 km²]), the Nordenskjöld archipelago, the Sergei Kirov Islands, and more. Many of these are uninhabited, and the others are populated by a total of a few thousand people, consisting of Russians (military personnel and staff of the various scientific and meteorological stations) and native peoples (Samoyeds and Eskimos).

The Franz Josef archipelago, located between 79° 45' and 82° 15' N latitude, consists of about a hundred islands made up of sedimentary and volcanic rocks covered by numerous glaciers. Maximum elevations occasionally exceed 2600 ft [800 m]. Partly covered by Arctic tundra, it is home to polar bears and to Arctic foxes and hares. Large numbers of seals live in the water. The islands were discovered in 1873 by an Austro-Hungarian expedition under Julius von Payer and Karl Weyprecht:

> *August 30, 1873—a day I shall always remember—we were at 79° 43' N latitude and 59° 33' E longitude. It was afternoon. Leaning on the ship's rail, we watched the rolling clouds, pierced now and again by a ray of sunlight, when suddenly, looming in the distance to the northwest, like a wisp of vapor, was a line of craggy cliffs, which within a few minutes proved to be a magnificent Alpine landscape. At first we were as if bewitched, not trusting our eyes; then, once we were sure that this fortunate vision was not a fugitive mirage, we all burst into happy cries of: "Land! Land! Land at last!"*
>
> *Suddenly there was not a single sick person on board; in an instant the prodigious news flashed around the ship, and everyone rushed up on deck to see with his own eyes that it was true.*
>
> *Yes, it was indeed true. In a dream, as it were, and by the wandering whim of our slab of ice, we had become great explorers; all that was left was to determine the size and nature of this country that had magically emerged from the Arctic chaos.*
>
> *Alas, we too were victims of that chaos, and we were unable, at least for the moment, to set foot on the land we had discovered; for anyone who had dared to leave the ice floe that was carrying us would have been separated from us and lost.*
>
> *Nevertheless, in our first flush of enthusiasm, we began to run along the ice, as if we could reach the object of our curiosity.*
>
> *Having reached the very end of our floating plateau, some four miles from the Tegetthoff, we were still about fifteen miles from the coast, which appeared closer. Unable to do more, we climbed up an iceberg to see if we could discern the interior of this mysterious land—its existence unsuspected by humans for thousands of years—that fate had presented to a handful of near-shipwrecked travelers, who hoped for nothing more than to see their homeland again, although perhaps the homeland considered them already lost. In honor of our sovereign, we immediately christened this section of coastline the "Land of the Emperor Franz Josef."*

The Novaya Zemlya archipelago, known to Russians and Norwegians since the Middle Ages and visited in the late 16th century by the Englishman Stephen Burrough (1556) and the Dutchman Willem Barents (1594), consists of two main islands that stretch out in a great arc and represent the northerly extension of the Urals system. Beyond the Kara Strait, they separate the Barents Sea, opposite the Sarmatian coast, from the Kara Sea which lies off Siberia, and which at this point is highly articulated by the deep estuaries of the Ob and the Yenisei. Like the Urals, the mountains of Novaya Zemlya (more than 4200 ft

[1300 m] and 5000 ft [1500 m] high) are formed of predominantly sedimentary rocks of Paleozoic date, folded and metamorphosed by the Caledonian and Hercynian orogenies.

The climate of these islands is distinctly polar (with a flora typical of the Arctic tundra), and the northern island is also covered with extensive ice fields. The terrestrial and marine fauna is extremely rich, represented by bear, reindeer, seal, wolf, whale, cod, and salmon. A few hundred Samoyeds live along the coast and support themselves by hunting and fishing; they are also present on the nearby islands of Kolguyev (1439 mi^2 [3728 km^2]) and Vaygach (1306 mi^2 [3383 km^2]).

Severnaya Zemlya was discovered even more recently (1913) by a Russian hydrographic expedition. The archipelago, made up of four main islands and several smaller ones, rises from the Siberian continental shelf and constitutes the continuation to the north (beyond Cape Chelyuskin) of the mountains which form the Taimyr peninsula, consisting of sedimentary rocks of Paleozoic age, partly covered by Quaternary deposits. Maximum elevations are less than 3300 ft [1000 m], and glaciers cover 40% of the islands' surface. Animal life is rather sparse, consisting of seals and polar bears.

North of the great Lena delta and east of Severnaya Zemlya is the Laptev Sea (named after Russian navigators who explored these waters in the early 18th century), which in turn is separated toward the east from the East Siberian Sea by another series of islands represented essentially by the New Siberian, Kotelny, and Lyakhov groups. All are generally low-lying, although the latter two have modest hills; this is the result of extended erosion applied to crystalline and sedimentary materials of various dates. There are abundant Quaternary deposits containing a rich fossil macrofauna (including mammoths).

The archipelago was discovered in 1770 by a Russian merchant Lyakhov. Also part of the archipelago are the small De Long Islands, named for the commander of the ill-fated American expedition aboard the *Jeannette*, which was crushed in the ice in 1881. The last major island in the Russian Arctic is Wrangel, located just north of the Chukchi peninsula and also discovered by De Long. Although two Canadian expeditions landed on the island in 1921 and 1923, the island was definitively occupied by the Soviet Union in 1924. Consisting of granitic and sedimentary rocks, it has a maximum elevation of about 3000 ft [900 m] and an extremely harsh climate. Its coastal waters are rich in seals and walrus.

The North American (Canadian) Arctic. With the exception of Greenland, the islands of the North American Arctic are all part of Canada, specifically of the Northwest Territories administrative division, which lies above 60° N latitude. Its present population is about 55,000; most of these are Inuit (Eskimo), Aleut, American Indian, or of mixed race, who live by hunting, fishing, and selling furs and crafts. There are also a few Canadians of European descent who work at scientific and meteorological stations and airfields.

The land areas of the Canadian Arctic, often joined together by the polar pack ice, are delimited to the south by the waters of Hudson Bay, to the east by the Davis Strait and Baffin Bay, and to the west by the Beaufort Sea. This region has a total area of about 770,000 mi^2 [2 million km^2], including the Melville and Boothia peninsulas.

These islands can be divided into three major sectors. The western sector has generally low-lying terrain and lies to the west of the Boothia peninsula, consisting of the large Victoria Island (81,930 mi^2 [212,200 km^2]), the islands of Banks (23,230 mi^2 [60,166 km^2]), King William (4955 mi^2 [12,833 km^2]), Prince of Wales (12,830 mi^2 [33,230 km^2]), and other smaller islands. The northeastern sector, dominated by Baffin Island (183,810 mi^2 [476,068 km^2]) with its extremely complex coastline, mountains more than 6500 ft [2000 m] high, and numerous glaciers descending the eastern slope that is dissected by deep fjords, includes other islands such as Bylot (4200 mi^2 [10,878 km^2]), Somerset (9,370 mi^2 [24,268 km^2]), and Southampton (15,700 mi^2 [40,663 km^2]). Finally, the northern sector consists, in addition to the narrow arms of the sea running along the 74th parallel (McClure Strait, Melville Sound, Barrow Strait, and Lancaster Sound), of the great Queen Elizabeth archipelago which includes the islands of Ellesmere (82,119 mi^2 [212,688 km^2]) and Devon (20,861 mi^2 [54,030 km^2]), both highly articulated and with mountains exceeding 6500 ft [2000 m], extensive ice caps, and glaciers plunging directly into the sea, and the smaller and generally flatter islands of Melville (16,369 mi^2 [42,396 km^2]), Prince Patrick (6081 mi^2 [15,750 km^2]), Axel Heiberg (15,779 mi^2 [40,868 km^2]), and Bathurst (7069 mi^2 [19,707 km^2]), near which lies the north magnetic pole.

In geological terms, the North American Arctic archipelago consists of extremely old crystalline rocks of Paleozoic and Precambrian date, often metamorphosed by folding and worn down by erosion. They belong to the American crustal plate, represented here by the Canadian Shield. Fairly low-lying, the region contains true mountain ranges only along its eastern edge, on Ellesmere and Baffin islands.

The dense hydrographic network, including many lake basins, also bears witness to the effects exerted on this region by the Pleistocene glaciations. The climate is typically polar, with very low temperatures throughout the year and absolute minimum values that can drop below −58°F [−50°C] in the winter. The vegetation is typical of the Arctic tundra, with mosses, lichens, anemones, saxifrages, and dwarf conifers and willows. The wild fauna is quite rich and varied, including seal, walrus, whales, and large terrestrial mammals (polar bear, musk ox, and caribou).

Arctic exploration. It is possible that the Arctic regions were visited, at least marginally, by solitary hunters or sailors at a very early period. It is known that Greenland was first inhabited in the 3rd millennium B.C. by Paleo-Eskimos from the Canadian North. During the Classical period, many were fascinated by the description of Thule, a place where the days are very long and the sea is entirely covered with ice, visited by the Greek explorer Pytheas in the 4th century B.C.

More concrete evidence, however, did not come until the Middle Ages: in his translation of Orosius' *History*, King Alfred the Great of England reported on the voyage made by the Norman navigator Othar in the second half of the 9th century, in which he rounded North Cape (Norway) and sailed into the White Sea to the mouths of the Dvina. At about the same time the adventurous travels of Vikings sailing northwest brought the Icelandic voyager Gunnbjørn within sight of the coast of Greenland; Erik the Red landed there in the second half of the 10th century and founded the colony of Brattelid (modern

Tungdiliafik). It was from Greenland that Erik's son Leif, and later Karlsefin (Thorfina), succeeded in reaching the North American shores of Labrador and Newfoundland, and perhaps pushing as far as the mouth of the Hudson river (992-1020).

After the Viking era, it was not until the 14th century that another Nordic navigator, the Norwegian Powell Knutsson, revisited Greenland and perhaps North America. At the end of the 14th century the Venetian brothers Nicolò and Antonio Zeno reached Iceland and Greenland, and may have glimpsed the North American coast. Beginning in the 16th century, the exploration of the Arctic regions proceeded by land in northern Siberia, Alaska, and the Canadian North, and by sea with the search for the two putative connections to the Pacific and eastern Asia, the "Northwest Passage" around Greenland, and the "Northeast Passage" via Scandinavia.

The impetus to search for an ocean passage between the North Atlantic and the Pacific came from John and Sebastian Cabot, father and son. The latter mounted the English expedition which may have discovered Novaya Zemlya (1553), a feat repeated by Barents who penetrated as far as Spitsbergen (1597) in what are today the Svalbard Islands. In the meantime, exploration toward the northwest was being advanced by the English navigators Martin Frobisher (1576-78) and John Davis (1585-87); Davis sailed beyond 72° N latitude along the strait that divides Greenland from North America and now bears his name.

Voyages to the northwest continued during the 17th century with the English explorer Henry Hudson, who discovered the immense bay that now bears his name (1610) and the strait which defines the Labrador peninsula; and his fellow countryman William Baffin, who reached Lancaster Sound (1616) without realizing that it would lead to the goal he sought. His name has been given to the great mountainous island north of Labrador, and to the bay which separates it from Greenland.

The Russian advance toward the Siberian Arctic also continued with Semyon Dezhnyov, who in 1648 sailed along the shore of the Arctic Ocean and reached the Kamchatka peninsula and the Bering Strait, thus proving the existence of a Northeast Passage. The Bering Strait itself, however, would not be crossed until its namesake, a Danish navigator, did so in the following century (1714) during a series of explorations supported by Czar Peter the Great, during which not only Vitus Bering himself, but also the Russian explorer Semyon Chelyuskin visited the northernmost tip of Eurasia (1742), now called Cape Chelyuskin. At the same time the Laptev brothers, Dmitry and Khariton, mapped the coast of the White Sea at the mouth of the Kolyma, after Nikolai Muravev and Pavlov (1735) had sailed through the Kara Sea and Malygine and Skuratov (1737) had explored the mouth of the Ob. During these expeditions the Russians also began to explore the Aleutians and Alaska, with the voyages of the German Georg Wilhelm Steller (1741-46). During this same period, the European presence in Greenland was reestablished with the colonization effort begun in 1721 by the Norwegian Protestant missionary Hans Egede, founder of the present-day capital, Nuuk, formerly Godthåb (1728).

In Alaska the Scottish explorer Alexander Mackenzie in 1789 traveled down the river which now bears his name to the shores of the Arctic Ocean, which were later also explored by the Englishman John Franklin (1820-25). At about the same time (1821-23), the Russian navigator Ferdinand Petrovich Wrangel ventured onto the Siberian pack ice to 72° N latitude. The first quarter of the 20th century also saw the resumption, after a 200-year hiatus, of the search for the mythical Northwest Passage: Lancaster Sound was reached by John Ross of Scotland in 1818; believing it to be merely a fjord, he turned back, but the following year (1819) his second-in-command, William Edward Parry, pressed on for another 560 mi [900 km], reaching 110° W longitude (Melville Strait) and also determining the position of the north magnetic pole. Another attempt by Ross in 1829 was equally unsuccessful; Franklin himself then tried again in 1845-47, with tragic results. Then it was the turn of the Irish explorer Robert McClure, who chose the opposite direction, sailing around Alaska and reaching as far as Victoria Island (1850). The next year, during another attempt, McClure sailed into the strait which separates Melville Island from Banks Island and which today bears his name; in 1853 he was rescued, in desperate circumstances, by a relief expedition that had arrived from the east. This finally demonstrated the existence of a Northwest Passage by sea from Greenland, although it was by no means an easy route. The remains of the unfortunate Franklin expedition were discovered in 1859 by another Irishman, Francis McClintock, on King William Island.

Exploration of the Siberian Arctic continued under Alexander von Middendorf, who explored along the Taimyr peninsula (1843), and later (1868-70) under Maysel and Kherski, who surveyed the Kolyma, Yana, and Indigirka basins. The Siberian sector of the Arctic Ocean was also visited, in the second half of the 19th century, by the Austro-Hungarian expedition of Karl Weyprecht and Julius von Payer, who discovered Franz Josef Land (1872), and by the Norwegian Adolf Nordenskjöld (1875), who reached the mouth of the Yenisei, rounded Cape Chelyuskin, wintered at the mouth of the Lena (1878-79), and arrived at the Bering Strait the next summer.

In 1888, the first crossing of Greenland was made by a Norwegian, Fridtjof Nansen.

In the meantime, following Parry's expeditions in search of the Northwest Passage, the international scientific community had been developing the idea of trying to reach the North Pole, in part to determine whether any land existed north of Greenland. Parry himself had set out from Spitsbergen Island in 1827 and reached 82° N latitude. In 1853, the American Elisha Kane got as far as the latitude of the great Humboldt glacier on the northwest coast of Greenland (80° N), and in 1861 his second-in-command, Isaac Hayes, passed beyond 81° N latitude and confirmed the existence of an ocean at the polar cap. Kane made numerous important scientific observations during his expedition, and also paid close attention to the customs and practices of the Eskimo population:

> *It is almost as difficult to trace back the customs of the Smith's Sound Esquimaux as it is to describe their religious faith. They are a declining—almost an obsolete—people,* "toto orbe divisos," *and too much engaged with the necessities of the present to cherish memorials of the past. It was otherwise with those whom we met in the more southern settlements. These are now for the most part concentrated about the Danish posts, in very different circumstances, physical as well as moral, from their brethren of the North....*
>
> *The walrus supplies the staple food of the Rensselaer Bay Esquimaux throughout the greater part of the year. To the south*

as far as Murchison Channel, the seal, unicorn, and white whale alternate at their appropriate seasons; but in Smith's Sound these last are accidental rather than sustained hunts.

The manner of hunting the walrus depends in a considerable degree on the season of the year. In the fall, when the pack is but partially closed, they are found in numbers, hanging around the neutral region of mixed ice and water, and, as this becomes solid with the advance of winter, following it more and more to the south.

The Esquimaux approach them then over the young ice, and assail them in cracks and holes with nalegeit and line. This fishery, as the season grows colder, darker, and more tempestuous, is fearfully hazardous....

The huts—those poor, miserable, snow-covered dens - are now scenes of life and activity. Stacks of jointed meat are piled upon the ice-foot; the women are stretching the hide for sole-leather, and the men cutting out a reserve of harpoon-lines for the winter....

On the day of my arrival, four walrus were killed at Etah, and no doubt many more by Kalutak at Peteravik. The quantity of beef which is thus gained during a season of plenty, one might suppose, should put them beyond winter want.... The poor creatures are not idle: they hunt indomitably, without the loss of a day. When the storms prevent the use of the sledge, they still work in stowing away the carcasses of previous hunts. An excavation is made either on the mainland, or, what is preferred, upon an island inaccessible to foxes, and the jointed meat is stacked inside and covered with heavy stones....

By their ancient laws all share with all; and, as they migrate in numbers as their necessities prompt, the tax on each particular settlement is excessive. The quantity which the members of a family consume, exorbitant as it seems to a stranger, is rather a necessity of their peculiar life and organization than the result of inconsiderate gluttony.

In 1871 the American journalist Charles Hall then reached the 82nd parallel, while the British explorer Albert Markham, following an expedition under Sir George Nares, penetrated to 83° 20' N latitude in 1876; in 1882 the Americans Lockwood and Brainard (on the heels of the ill-fated expedition of Adolphus Greely, who attempted to establish the first permanent scientific outpost in Ellesmere Land) reached 83° 24' N. The race for the Pole now seemed more of a sporting event than a simple matter of scientific exploration. Meanwhile, the tragic outcome of the expedition led by the American George De Long (1879), the wreckage of which was carried by ocean currents to the east coast of Greenland, had convinced Nansen to utilize those same currents to approach the Pole: having drifted with the pack ice from the Kara Sea (1893) on board the *Fram*, he abandoned the ship 16 months later and continued by sled; in 1895 he became the first to reach 86° 14' N latitude.

The 19th century ended with the foolhardy and tragic attempt by the Swede Salomon Andrée to reach the Pole by balloon (1897), and with the land expedition of the Duke d'Abruzzi, during which Umberto Cagni (1900) halted at 86° 34' N latitude, a new record in the race toward the Pole. The goal may have been attained by the Americans Frederick Cook (1908) and Robert Peary (1909), but there is no irrefutable proof that they actually reached their destination. In the meantime, exploration of the Siberian Arctic islands continued with the discovery (1913–14) of Severnaya Zemlya by the Russian Boris Vilkitsky, while the exploration of Greenland was pursued first by Ludvig Mylius-Erichsen of Denmark (1906), then by his fellow Danes Knud Rasmussen and Lauge Koch, who organized the famous Thule Expeditions (1912–21). Other scientific and exploratory expeditions in Greenland were undertaken in the 1920s and 1930s by Koch, by the German geophysicist Alfred Wegener (author of the theory of continental drift), and by the Italian Leonardo Bonzi (1934), and in the 1940s and 1950s by Paul Émile Victor of France.

In the course of his expeditions, Wegener succeeded in establishing the Eismitte geophysical station at the center of Greenland, where he later died (1931) during a daring trek undertaken under impossible conditions. In the American Arctic, during the early part of the century (1903–06) the Norwegian explorer Roald Amundsen was the first to travel, in a small ship, from the Beaufort Sea to the Atlantic, through the labyrinth of islands dotting the Far North. In 1944 the Canadian ship *Saint-Roch* completed the Northwest Passage in a single season, while in 1969 the ice-breaking supertanker *Manhattan* arrived at the harbor in Prudhoe Bay, in Alaska, less than a month after leaving Philadelphia. In addition, regular connections all along the Siberian Arctic coast were established following the political annexation of all the lands located between the Pole and the meridians of 32° 04' and 168° 49' E of Greenwich, promulgated in a decree of the Soviet government in 1926; this was made possible, for several months out of the year, by the use of powerful icebreakers. More recently, the French polar ship *Astrolabe* traveled the entire Northeast Passage in the summer of 1991, leaving the French port of Le Havre and arriving at Hakodate in Japan a little over a month later.

After Andrée's attempt, efforts to reach the Pole by air resumed: in 1923 the Norwegian Roald Amundsen tried with two seaplanes, but without success. It was not until 1926 that the American Richard Evelyn Byrd managed to fly over it in his aircraft, followed two days later by the dirigible *Norge* piloted by Amundsen and the Italian Umberto Nobile. The latter returned to the Pole two years later with the dirigible *Italia*, but it crashed on the return journey.

The first attempt to reach the Pole underwater was made in 1931 by the Australian Sir George Hubert Wilkins; the feat was not accomplished until 1958, by the American nuclear-powered submarine *Nautilus*. The development of motorized transport made it easier to reach the Pole over land, as demonstrated by the expeditions of Ralph Plaisted (1968) and Guido Monzino (1972); in 1977 the Soviet icebreaker *Arktika* opened a sea route. Meanwhile, in 1969 the Pole had been reached again over land by the British expedition under Wally Herbert, who used traditional dogsleds; setting out from Cape Barrow in Alaska, he stopped 25 mi [40 km] north of the Svalbard Islands.

The tragedy of the dirigible *Italia* is described by Giotto Dainelli in his book *La gara verso il Polo Nord* [The race for the North Pole]:

From Baja del Re the Italia *set course west–northwest, under generally calm skies.... It was a truly amazing journey: a little after midnight on the 24th of May, 1928, they were over the Pole: from the northernmost tip of Greenland they had covered over 400 mi [700 km] in only about 6 hours, an average speed of 64 mph [103 km/h], which was almost miraculous, especially after the adverse weather that had so often accompanied the*

expedition since the crossing of Germany toward Stolp.... The Italia *circled for a while around the imaginary point representing the top of the world, and dropped an Italian flag, the banner of the city of Milan, and a wooden cross blessed by the Pope; then it regained altitude back to 3300 ft [1000 m], and at 2:30 a.m. on that same day set off south along the 25th meridian east of Greenwich. The air was freezing cold and gray, and the strong wind occasionally blew gusts of snow against the airship.*

It was this south wind that had facilitated the journey toward the Pole but now impeded their return. More precisely, it blew from the southwest, so that it not only slowed down their flight but also caused them to drift eastward, and all this change in speed and drift could not be measured due to the fog and clouds. The snow, settling all over the dirigible and turning into ice, weighed it down and once again caused the propeller blades to hurl out dangerous fragments that struck the envelope. As happy and triumphant as they had felt over the two previous days, they now felt equally dejected and even fearful, although their course was bringing them—albeit irregularly—closer to Baja del Re. Then there was the incident of a seized engine; and there also must have been a loss of gas from the stern, as later events suggested. At a certain point, to resolve the terrifying uncertainty with regard to the dirigible's position, it was brought to an altitude of 3000 ft [900 m], above the fog and in full sunlight, and the crew found they were about 45 miles northeast of the Ross Islands, or about 180 miles from Baja del Re. This meant only another few hours of flying to reach their home base and safety. The airship was brought even further down, to an altitude of 1000 ft [300 m]. This was perhaps a mistake, because the moisture conditions there once again caused increased formation of ice on the envelope, and the greater weight of the dirigible rapidly became worrisome. It descended at an ever-increasing rate, becoming more and more stern-heavy, perhaps because of a gas leak as already mentioned. The few actions taken in this difficult situation were unavailing: at 10:33 on that fateful day, May 25, the airship struck at tremendous speed, rearing nose-up, against the pack ice bristling with hummocks and peaks; the terrific impact jarred the gondola loose, and it disintegrated along with everyone and everything that it contained.

THE ANTARCTIC

A remote, inaccessible, and forbidding environment, Antarctica, a continent representing 10% of the world's land area, was still virtually unknown a century ago. Not until the early 1900s did a few bands of explorers penetrate its interior in the race to reach the South Pole. Humans did not return to Antarctica until fifty years later, and even then in very small numbers compared to the multitudes inhabiting the other continents.

The Antarctic continent covers almost 5.5 million mi^2 [14 million km^2], including the island areas and ice shelves, with a diameter of about 2500 mi [4000 km] and an approximately circular outline interrupted by the two great embayments of the Ross and Weddell Seas, which divide two geomorphologically distinct continental masses: East and West Antarctica. Antarctica is the most isolated of the continents, lying 590 mi [950 km] from the tip of South America, 1425 mi [2300 km] from Tasmania, 1365 mi [2200 km] from New Zealand, and 2230 mi [3600 km] from Africa.

Several archipelagoes and minor islands dot the vastness of the Antarctic (or Southern) Ocean in the sub-Antarctic zone. Moving east from the Atlantic sector, they are the Falklands (Malvinas) and South Georgia (the only inhabited group); the South Sandwich Islands; the South Orkneys; Bouvet Island; Crozet, Marion, and Prince Edward islands; the Kerguelens; and Heard, Macquarie, and Campbell islands. Most of these remote and desolate islands are the volcanic tips of the ocean ridges which surround Antarctica.

Physical and geological description. The principal continental mass of Antarctica lies south of the Atlantic, Africa, India, and Australia, and constitutes East Antarctica. Beneath the ice cap which covers it, the rocky surface of East Antarctica barely rises above sea level. Its crust consists of a Precambrian metamorphic and crystalline basement and an overlying sedimentary and volcanic covering dating from the upper Paleozoic and lower Mesozoic, similar to the formations constituting the other southern continents. The Transantarctic Mountains lie along the edge of East Antarctica, rising up 14,860 ft [4530 m] and extending for almost 2500 mi [4000 km]; at its feet two wide epicontinental basins open up: the Ross Sea, which lies along the Pacific sector, and the Weddell Sea facing the Atlantic.

West Antarctica, smaller and with much more vigorous relief, faces the Pacific sector; in reality, it is a complex archipelago comprising a number of small crustal fragments of various ages and compositions, including the Ellsworth Mountains which top out at 16,860 ft [5140 m] on Mt. Vinson, and the huge crustal block of Marie Byrd Land. West Antarctica extends northward into the Antarctic Peninsula, which represents the southern extension of the Andes Mountains; direct connection between the two was broken 23 million years ago by the intrusion of a southern Pacific crustal plate. This created what is now the Drake Passage; today the Antarctic Peninsula and South America are structurally linked by the arc of the South Sandwich Islands. West Antarctica has been an active continental margin throughout the Mesozoic and Cenozoic, as witnessed by widespread volcanic activity.

Two hundred thirty million years ago, Antarctica represented the central part of the now-dismembered supercontinent called Gondwanaland, whose constituent blocks slowly moved apart to form the southern continents. East Antarctica moved into its polar position about 80 million years ago, when it was still attached to Australia; the two continents moved apart some 55 million years ago.

Recent oceanographic explorations have confirmed the individuality and physical continuity of the Antarctic Ocean, which covers 12 million mi^2 [30 million km^2] south of the polar front (or Antarctic Convergence). This irregular, variable band located between latitudes 52° and 55° S is a few dozen miles wide and extends uninterruptedly around the polar seas. Along the polar front, the cold Antarctic surface waters plunge below the warmer sub-Antarctic water, marking the boundary of the Antarctic Ocean, differentiated from the other oceans by the distribution and dynamics of its water masses, and because its surface freezes over seasonally to form the south polar ice pack.

The first traces of continental glaciers in Antarctica date back almost 50 million years, although fossils indicate that the climate at this period was still generally temperate. A general cooling trend set in about 38 million years ago, but great accumulations

of ice extended more and more frequently over the continent during the last 20 million years, after the Drake Passage had opened up and created one continuous Southern Ocean. Since then an uninterrupted circumpolar current has flowed from west to east through the Southern Ocean, isolating Antarctic waters and keeping them cold. The oceanic circulation around Antarctica initiated a positive-feedback process by which the polar regions, and especially Antarctica, now act as the "cold sinks" of the thermodynamic engine represented by the atmosphere and the global oceans; a cold climate has persisted in these regions through geological time, allowing ice caps to form on a continental scale.

The Antarctic ice cap has covered the continent repeatedly: about 10 million years ago it had approximately its present dimensions, but 4.5 million years ago it was larger still, and even the sub-Antarctic islands were covered with small ice caps.

The present-day ice cap covers the entire continent and joins the two Antarcticas together. Less than 2% of Antarctica's territory is free of ice; often only the highest rocky peaks, or "nunataks," emerge from the ice, like islands in a frozen sea. The average thickness of the cap is over 6500 ft [2000 m] and it is more than 14,500 ft [4500 m] thick in some places. In the basins of West Antarctica, the base of the ice cap may be well below sea level. The presence of the ice cap gives the continent an average elevation of 7500 ft [2300 m], the highest on Earth.

The volume of ice in the Antarctic cap is almost 12 million mi^2 [30 million km^3], pressing down on the continental crust with a weight of almost a billion tons. The weight of the ice cap has pushed the continent about 2000 ft [600 m] into the asthenosphere, with the result that the submerged continental shelves around Antarctica are also very deep, lying at 1650–2300 ft [500–700 m] below sea level rather than the 650 ft [200 m] found around the other continents. The ice cap that has accumulated over the course of hundreds of thousands of years represents 91% of the terrestrial ice on Earth, and 68% of its fresh water; it is therefore the Antarctic's most important potential natural resource.

The masses of ice flow slowly from the center of the continent toward its edges, where their movement accelerates to a speed of a few hundred yards a year. Glaciers with a relatively rapid flow rate often pass through the stationary ice of the cap itself. When the glaciers reach the coast, they break into icebergs which drift through the Southern Ocean for hundreds or thousands of years.

The inland and marginal seas are the site of the great fluctuating ice sheets that are fed by the main glacial flows off the cap; it has been demonstrated that ice sheets cannot become established over the deep ocean. The Ross and Weddell sheets extend over hundreds of thousands of square miles of flatness; their thickness varies from 2600 to 3600 ft [800–1100 m] at the center to 650–1000 ft [200–300 m] at the edges, where they meet the sea as tall vertical ice cliffs. These are the Great Barriers which awed the first explorers. Tabular icebergs break off from the ice shelves in dimensions that can range up to 60 miles [100 km] and drafts of up to 800 ft [250 m]; they are characteristic of the marine landscape of the Southern Ocean. It has been estimated on the basis of satellite observations that about a hundred thousand icebergs with dimensions exceeding 1000 ft [300 m] are drifting in the Antarctic polar seas.

The pack ice forms between February and December, as huge areas of the ocean's surface freeze. The seasonal pack ice of the Southern Ocean is one of the most magnificent natural phenomena visible on the Earth as seen from space; for much of the year it locks the continent in a belt 250–800 mi [400–1300 km] wide, isolating it completely. In September the pack ice covers 8 million mi^2 [20 million km^2] of the ocean's surface, while during the brief summer it still covers at least 1 million mi^2 [3 million km^2].

Climate, flora, and fauna. The climatic characteristics of the Antarctic continent are determined by its polar position and its isolation. Day and night are each months long at certain times of the year, while a crepuscular half-light predominates at other times.

Antarctica is the coldest continent: on the endless stretches of ice in the central highlands, average temperatures are around −85°F [−65°C] between April and September, rising to about 22°F [−30°C] between December and February. The low temperatures of the interior result from a number of factors, including the considerable elevation above sea level, the high reflectivity of the ice (which sends much of the incident solar radiation back into space), and a persistent seasonal high-pressure area called the "winter polar vortex." Average summer temperatures along the coasts are just below freezing, and drop to −22°F [−30°C] for the rest of the year.

Because of the very low ground temperatures, even the rocky subsoil is permanently frozen for thousands of feet; this phenomenon is known as permafrost. Water in the liquid state is a rare and ephemeral substance. Because the temperature is lower at the surface than in the atmosphere just above, extremely violent cold winds form, descending by gravity from the center of the ice cap toward the edges of the continent: these katabatic winds, with gusts that can exceed 180 mph [300 km/h], continually lash the great geomorphological basins.

In the continental interior, precipitation (in the form of snow, of course) is only about 2 in. [50 mm] per year, a level which makes Antarctica one of the largest deserts on Earth, even though snowfall increases substantially along the coasts. Along the margins of the Antarctic Peninsula, milder temperatures and more frequent precipitation characterize a cold maritime climate. The climate of the archipelagoes north of the peninsula, and of the remote sub-Antarctic islands is even less harsh.

The "sub-Antarctic" region is the term applied to the broad band of the Southern Ocean in which average temperatures in the warmest month remain below 50°F [10°C]. This band is located south of the polar front and north of the maximum pack ice limit. The sub-Antarctic seas are the stormiest on Earth; between 40° and 60° S latitude, an uninterrupted cyclonic circulation blows over the ocean from west to east. Throughout this area, storms follow one another at a rate of one every 5–7 days, each lasting 3–4 days; the continuous disturbances represent another climatic barrier blocking access to the continent.

Life has succeeded in adapting appropriately to the climatic conditions of the Antarctic region. Terrestrial biological ecosystems are poor, isolated, and therefore geographically diverse, while the marine systems are much richer and better developed.

The sub-Antarctic islands are home to an endemic flora similar to that of the tundra, consisting of a few species of vascular plants and numerous forms of more primitive plants. The fauna

is limited to invertebrates, with the exception of four species of seasonal birds in the two larger archipelagoes; there are no other endemic terrestrial vertebrates either in Antarctica or on the islands. The higher animals (seals, penguins, birds) that inhabit the coasts during the breeding season are all essentially maritime.

The immature soils of the Antarctic coasts have been colonized by a sparse vegetation of lichens, mosses, and liverworts. Terrestrial organisms become rarer and more primitive as one moves toward the rare unglaciated interior areas. A few forms of life have managed to colonize even the most extreme environments by means of enormously risky adaptations: the small insects of the unglaciated coastal regions hibernate for 320 days a year, while endolithic algae and bacteria exploit the favorable microclimate that exists in tiny interstices beneath the surface of the rocks, where solar summer heat and dissolved salts allow traces of liquid water to exist.

The "dry valleys" of the Transantarctic Mountains are considered by students of extraterrestrial environments to be the earthly environment potentially most similar to that of other planets.

Life in the Southern Ocean and the Antarctic seas is very rich and diverse. The benthic ecosystems of the ocean depths are not well known since they are so difficult to observe but rich communities of coelenterates, arthropods, mollusks, echinidae, and fish have been seen at depths accessible to photography. Benthic ecosystems are differentiated in terms of depth and geographical region; it is estimated that their biomass represents 60% of the total marine biomass of the Southern Ocean.

A unique and extremely rich pelagic marine ecosystem has developed in the pack ice zone; occupying the entire ocean around Antarctica with essentially no geographic differentiation, it is perhaps the most extensive on Earth. The foundation of the system is the single-celled algae which synthesize organic material from solar energy; they represent the greatest productivity, and exist in quantities grossly estimated at between 600 and 1 billion tons. The development of these algae is linked to the state of the pack ice, and resumes each year as sunlight returns and the sea ice melts, allowing them to propagate gradually southward.

The algae are eaten by small herbivorous planktonic crustaceans known collectively as "krill." By far the most common krill species is the shrimplike *Euphausia superba*, followed by a dozen other species. Krill migrate slowly in shoals of inconceivable numbers, and represent much of the biomass of the pelagic marine fauna. In 1981 an oceanographic ship in the Weddell Sea crossed a shoal of krill that turned the sea red for a dozen miles, and was estimated to consist of 2.5 million tons of animals.

A carnivorous plankton, predominantly made up of copepods, has developed in the sub-Antarctic zone alongside the herbivores. In the pack ice zone, krill make up the central and fundamental link in the food chain: every higher animal is a direct or indirect predator of krill, and is absolutely dependent on them. In no other ecosystem is the food chain so short and so dependent on this intermediate link, which is why biologists worry that the entire ecosystem might be threatened by indiscriminate industrial-scale harvesting of krill.

The principal predators of the krill themselves are the cephalopods (squid and others), fish, seabirds, penguins, and several seals, including the widespread crab-eating seal. Baleen whales migrate every summer from tropical to polar seas in order to feed on krill; the spacing of the baleens in various whale species differs depending on the particular krills that constitute their specialized diet. By the end of the polar season, a whale may have increased its weight by 60%. Other marine species (fish, birds, leopard seals, killer whales, and other toothed whales) depend indirectly but no less absolutely on krill, since they feed on species which eat them.

The surface marine fauna of the Antarctic region has been known ever since the first explorations in the late 1700s, since during the breeding season these species, which spend the rest of the year dispersed over the vast Southern Ocean, concentrate in vast numbers on the rare beaches and along the coasts.

Birds represent a biomass of at least half a million tons, with numbers probably exceeding 240 million. There are more than 20 million penguins; one Antarctic species with an extraordinary environmental adaptation strategy is the emperor penguin (*Aptenodytes forsteri*), which stands and broods a single egg on top of its feet all through the icy polar winter. The Adelie penguin (*Pygoscelis adeliae*) is the most common. Other Antarctic seabirds include petrels, albatross, gulls, and cormorants.

Antarctic and sub-Antarctic seals are represented by six species, of which the crab-eating seal is estimated to number 12–15 million individuals. This species alone constitutes 80% of the world's entire pinniped biomass. Two strictly Antarctic species, the Weddell seal and Ross seal, are uncommon; the sub-Antarctic species (elephant seal and fur seal) are familiar from the commercial exploitation they suffered in the past.

Southern whales, seasonal migrants to Antarctic waters, are represented by seven baleen species and eight species of toothed whales. Almost all southern whale populations have been severely reduced by whaling.

Antarctic exploration. The Antarctic, the last continent to be discovered, has only been partly explored and is the only one not colonized by humans.

For the ancient Greeks, a southern continent had to exist by philosophical necessity —in their cosmology based on order and equilibrium— to balance the masses of the boreal continents. For medieval Christians, a southern landmass could not exist by theological preclusion: a land whose population was inaccessible to redemption could not have been created. At the time of the great explorations of the 16th and 17th centuries, many maps recorded a hypothetical southern continent that was enormous but had never in fact been seen (*Terra Australis incognita*).

Humans had never lived in Antarctica prior to the explorations of the 19th century, and it is improbable that they ever visited the continent accidentally. Among the native populations of the Southern Hemisphere, the inhabitants of Tierra del Fuego did not have the capability of sailing across the Drake Passage (a difficult feat even today); the Polynesians have legends describing icebergs, which could indeed have been swept far to the north, up to the 40th parallel, by ocean currents.

The sub-Antarctic seas were visited by Spanish and Portuguese navigators in the late 1500s, when several sub-Antarctic islands, including the South Shetlands, were discovered. The first systematic exploration of these polar waters, however, was conducted by the Englishman James Cook, who between 1772 and 1775 circumnavigated Antarctica twice, encountered the pack ice and tried to penetrate it, and finally succeeded in passing beyond the Antarctic Circle to a latitude of 71° S. At about

the same time, the French navigator Yves-Joseph de Kerguélen-Trémarec sailed in search of southern lands and discovered the islands which now bear his name.

Cook's geographical explorations were followed by commercial explorations by seal hunters, who by the mid-19th century had discovered all the sub-Antarctic islands, the Antarctic Peninsula (visited for the first time in 1814 by the Argentinian admiral Guillermo Brown), and the archipelagoes around it. In 1820 the American seal hunter Nathaniel Palmer, the English captain Edward Bransfield, and the Russian admiral Fabien Gottlieb von Bellingshausen came within sight of the peninsula. Twenty years later, three other important geographical expeditions began to survey and map the coasts of the continent: they were led by James Clark Ross (Great Britain), Jules-Sébastien-César Dumont d'Urville (France), and Charles Wilkes (United States). Geographical exploration of the Antarctic coastline stagnated in the second half of the 19th century, but once the southern whales had been discovered, the whaling fleets continued to ply Antarctic waters.

The period between the end of the 19th century and World War I is called the "heroic age" of Antarctic exploration, with numerous expeditions organized by many countries, including Belgium, Norway, Germany, Sweden, Great Britain, France, Japan, and Australia. The attempts to penetrate the ice-covered interior of the continent and reach the South Pole were so agonizing as to amply justify the term "heroic" applied by historians.

The first brief recorded landing on the coast of East Antarctica did not occur until 1895. In 1899 the Belgian Adrien de Gerlache de Gomery was forced to spend the winter trapped in the Antarctic ice; in 1900 the Norwegian Carsten E. Borchgrevink spent the first winter on the continent, at Cape Adare in Victoria Land. The British explored Antarctica with expeditions under Robert F. Scott, William Bruce, and Ernest Shackleton; the French under commander Jean-Baptiste Charcot; the Germans with Erich Drygalski and Willem Filchner; the Swedes with Nils Otto Nordenskjöld; the Norwegians with Roald Amundsen; the Japanese with Lieutenant Choku Shiraze; and the Australians with Douglas Mawson. Several explorers perished among the polar ice. The race to reach the South Pole was begun by the Norwegian Roald Amundsen, who was aiming solely to reach that geographic goal, and by Robert Scott of Great Britain, who not only reached the Pole but also undertook an ambitious and diverse program of scientific research. Two of his teams explored North Victoria Land and the Transantarctic Mountains.

In 1911 Amundsen and Scott wintered in the Ross Sea, the former in Bay of Whales and the latter on Ross Island; in spring they each set out toward the South Pole. Amundsen used dog-sleds, while Scott traveled with horses (which proved unsuitable), then dog teams (in insufficient numbers), and finally a human hauling party. On December 14, 1911, Amundsen reached the Pole, where he left a tent and a mocking letter to Scott. The British group, gradually reduced in numbers and beset by difficulties, reached the Pole on January 25, 1912. Scott and his four companions died on the return trip; the last three perished, pinned down by a blizzard, only 10 mi [17 km] from a food cache that would have saved their lives. The last words written in Scott's journal, in what had become a shaky hand, date from March 29.

In his book *Captain Scott: The Full Story*, Harry Ludlam passes on Scott's last emotional message to his compatriots:

> *The causes of the disaster are not due to faulty organisation, but to misfortune in all risks which had to be undertaken....*
>
> *We fought these untoward events with a will and conquered, but it cut into our provision reserve....*
>
> *On the summit in lat 85 deg/86 deg we had -20 deg, -30 deg ... in the day, -47 deg at night pretty regularly, with continuous head wind during our day marches. It is clear that these circumstances come on very suddenly, and our wreck is certainly due to this sudden advent of severe weather, which does not seem to have any satisfactory cause. I do not think human beings ever came through such a month as we have come through, and we should have got through in spite of the weather but for the sickening of a second companion, Captain Oates, and a shortage of fuel in our depots for which I cannot account, and finally, but for the storm which has fallen on us within 11 miles of the depot at which we hoped to secure our final supplies.*
>
> *Surely misfortune could scarcely have exceeded this last blow. We arrived within 11 miles of our old One Ton Camp with fuel for one last meal and food for two days. For four days we have been unable to leave the tent—the gale howling about us. We are weak, writing is difficult, but for my own sake I do not regret this journey, which has shown that Englishmen can endure hardships, help one another, and meet death with as great a fortitude as ever in the past. We took risks, we knew we took them; things have come out against us, and therefore we have no cause for complaint, but bow to the will of Providence, determined still to do our best to the last....*
>
> *Had we lived, I should have had a tale to tell of the hardihood, endurance, and courage of my companions which would have stirred the heart of every Englishman. These rough notes and our dead bodies must tell the tale, but surely, surely, a great rich country like ours will see that those who are dependent on us are properly provided for.*

Between the two world wars, Antarctic exploration was resumed by a number of countries. U.S. explorers, among them Admiral Richard Byrd, were now routinely making use of aircraft, as were the Germans and Australians. On the eve of World War II both the British and Americans had military bases in Antarctica, but unlike those in the sub-Antarctic region, they were not used during the conflict.

In the first decade after World War II, the United States, the Soviet Union, Australia, France, Argentina, and Chile all established scientific or strategic bases and resumed exploration, in some cases with massive resources: the continental-scale American campaign of 1946–47 involved 4700 people. This period marks the beginning of the contemporary era in the brief human history of Antarctica, an age of both science and strategic maneuvering. The largest exploratory operation conducted in the Antarctic was not national, but international, undertaken jointly by 13 countries as part of the International Geophysical Year of 1957–58. In 1958 Silvio Zavatti gave this description in his *L'esplorazione dell'Antartide* [Antarctic exploration]:

> *With the most recent expeditions, the nature of Antarctic exploration had changed decisively and definitively, both in terms of aims—focusing mostly on science, specifically nature and geophysics, rather than topography—and with regard to the methods used to achieve them—for the most part technological*

and mechanical. The nature had therefore changed, but the pace had also intensified, as is easily realized from the existence of so many concurrent expeditions, or missions, organized by nations from essentially every continent. As others have mentioned on numerous occasions, reasons other than purely scientific ones certainly increased the enthusiasm for this undoubtedly noble international competition.

In the last few years this contest has become even more intense, and it will continue with the same intensity at least for all of 1958, since as everyone knows we are in the midst of the "International Geophysical Year," which has been joined by some forty nations and which—with much greater consensus and much more generous financial contributions—is intended to support simultaneous, planned research in the field of geophysics in its broadest sense.

Projects during the International Geophysical Year include, for example, oceanographic investigations in the waters all around Antarctica, designed in particular to study ocean circulation and the moving boundary between polar and temperate water, not to mention regular soundings to determine the location and size of the continental shelf, and sampling to retrieve sediments from the ocean floor. Also part of the program, and of considerable importance, are studies of the Earth's magnetism, and the location of the south magnetic pole and its movements. There will also be gravimetric observations and research on the seismic properties of this great continent, where movements of adjacent plates of the Earth's crust are believed to have occurred even in fairly recent geological time.

This undertaking was a seminal one in terms of its effects on the geopolitical face of Antarctica, and remains unequaled for the breadth of its objectives and the magnitude of the commitment. Thousands of people, predominantly scientists, took part; some 40 bases and scientific observatories were built. For the first time, camps were set up on the glaciers of the interior highlands, including an American station at the South Pole and a Soviet one at the "pole of relative inaccessibility." A historic transcontinental traverse was made, covering 2800 mi [4500 km] with trains of tractors and sleds.

Human settlement. The hostile environment has consistently restricted a human presence in Antarctica, and still imposes severe limitations despite the use of the latest technological resources, which are useful but costly. The pack ice impedes navigation in winter, but even in summer a number of ships have been lost to storms or collision with icebergs. The violent and sudden blizzards are capable of immobilizing travelers on foot or on sleds, as well as surface vehicles and aircraft. Dehydration, snow blindness, altitude sickness, and frostbite lie in wait for anyone unprepared for this glacial environment. Enforced communal living in tight spaces at winter bases, isolated for ten months of the year in the polar twilight and night, demands suitable psychological adaptation.

Human presence has therefore always been minimal. The first base with a permanent population (albeit of only a few individuals), the weather station on the sub-Antarctic Laurie Island, dates back to 1904. For a few years around 1929, whaling stations gave South Georgia a winter population of about 200. Prior to the 1950s, some small groups wintered over sporadically at a few scattered bases, like the famous Little America set up on the Ross Platform ice. With the International Geophysical Year of 1957, Antarctica's winter population jumped from a few dozen people to 900, a figure at which it has remained since then.

The summer population of Antarctica's bases is presently 4000–5000 persons, who remain for an average of two to three months; adding to this number are the crews of the ships, most of them fishing vessels, that sail the Southern Ocean. Since the 1980s, a few thousand tourists have spent a week or two each summer south of the 60th parallel.

In 1974 two countries, Argentina and Chile, undertook a colonization effort, settling a few family groups on the Antarctic Peninsula where the climate is less hostile. These small settlements—immensely costly and neither spontaneous nor self-sustaining—are of great symbolic value to their respective governments.

Aside from this experiment, the small human settlements of Antarctica possess demographic characteristics typical of frontier regions. These intrusive, temporary populations are neither stable, complete, nor balanced: each person's stay is almost always limited to a few months, rarely more than a year; men predominate, mostly young to middle-aged, professionally specialized, and variously motivated to undertake an unusual but impermanent experiment. As in every population with a very rapid turnover, there is no shortage of adventurers.

Political and strategic conditions are such that the fragile human population of Antarctica is not united. All the bases have a national affiliation; they are generally isolated from one another, and linked only to the parent country by extremely long supply lines.

Antarctica's settlements, almost all of them scientific stations or camps, constitute minuscule human outposts in an immense glacial expanse essentially devoid of other forms of life. An Antarctic base of moderate dimensions is typically designed to house several dozen people during the three summer months, and one or two dozen for the rest of the year, in special structures. Essential facilities include stockpiles of fuel and supplies, power generators, equipment to produce water from ice, and communications devices. Many of the coastal bases set up by the 27 countries currently present in Antarctica are of this type, including the Italian base in Terra Nova bay, located on the west coast of the Ross Sea. Bases built on rock are similar to high mountain shelters; those on the ice cap or ice shelves may quickly become unusable as snow accumulates which is why they are designed to be half-buried in the ice.

The U.S. base called McMurdo, on Ross Island, is the largest in Antarctica and the gateway to operations throughout the continent, capable of housing more than 1,000 people in summer and over 150 for the rest of the year. This and a few other Argentine, Chilean, and British bases at the tip of the peninsula resemble tiny frontier towns.

Some of Antarctica's natural resources have already been exploited; others, presumed to exist but not confirmed, are the subject of exploration and speculation. Exploitation of potential resources might determine the future of the region, which until now has essentially remained in its unaltered natural condition. A lively debate on future uses of Antarctica is under way in international circles, especially at Antarctic Treaty meetings. On the one hand, there are plans for exploitation of resources, colonization, and strategic occupation by the great powers and by nearby countries, as well as commercial development (consist-

ing at present of tourism). On the other hand, consideration is being given to the possibility of conserving all of Antarctica as the world's largest natural park, so that its unique and uncontaminated natural environment could be protected and could serve as a global purifying agent for a planet increasingly poisoned by the consequences of industrialization and overpopulation on the other continents.

Living resources. The enormous Southern Ocean is home to a rich fauna of higher animals (seals and birds) that gather seasonally on the rare beaches to breed. In the past, these great seasonal concentrations offered abundant and easy opportunities for hunters. The southern fur seal was hunted from the late 1700s until about 1850, when it had virtually disappeared, its population having been reduced from 2.5 million to a few hundred. On South Georgia, 320,000 skins were taken in the summer of 1822 alone. On the sub-Antarctic islands the elephant seal, males of which can weigh up to four tons, was hunted for its blubber throughout the 19th century, and this species was also decimated. Extraction of oil from king penguins also began in the early 1900s, but this industry never developed further.

The whales of the Southern Ocean were hunted and decimated in three phases. Exploitation of the slowest species began as early as the late 19th century, while the other great whales were hunted from the end of the 19th through the first decades of the 20th century, after the invention of the harpoon cannon, when the whaling industry still relied on land-based processing plants. After 1923, with the introduction of factory ships that could operate on the high seas, attention also turned gradually to the smaller species. Between 1930 and 1980, approximately 40,000 whales were killed every year in southern waters. Whaling activity was largely suspended in 1986, but several thousand whales are still killed each year in the Southern Ocean. The destruction inflicted on the great southern whales is staggering: the white whale has disappeared, the blue whale has been reduced to 5% of its initial population, and all the other large species have suffered similar decimation.

Exploitation of fish resources did not begin until a few decades ago. Deep-sea fish were taken from around the larger sub-Antarctic islands in the 1970s and 1980s, and stocks were soon depleted; given the slow growth of these species, it will take many years to reestablish the adult populations. Krill are the greatest potential resource for the future; harvests in recent years have produced up to 2 million tons annually. Krill fishing has not yet developed into a large-scale industry due to a number of technical difficulties, particularly packing of the catch, but the resource is so abundant that many countries are actively engaged in experimenting with commercial krill fishing.

Mineral resources. Many tales have been spun about the supposedly enormous mineral wealth of the Antarctic, which is believed to exist on the basis of geological analogies with ore-bearing terrains on the other southern continents to which Antarctica was joined during previous epochs. A statistical study has predicted that Antarctica contains some 900 ore deposits, including about forty in ice-free areas. However, aside from one low-grade iron deposit in the Prince Charles Mountains, no deposits have actually been found. In any case, mining techniques for operation underneath the ice cap have not yet been developed.

Expectations of finding oil in the Ross and Weddell basins and on the continental shelf around Antarctica have a better probability of being realized. However, a number of prerequisites exist for economically feasible Antarctic oil production, none of which have been met: the oil deposits have yet to be identified and oil-drilling technologies used in the Arctic must be developed further for the much more hostile and dangerous environmental conditions of Antarctic waters, not to mention that extraction difficulties and distance from markets would make Antarctic oil, if it were discovered, extremely expensive.

The Antarctic continental ice cap, created by atmospheric precipitation, represents the largest water reservoir on Earth, constituting 68% of the world's fresh water. If Antarctic ice could be transported to arid regions, it would be a potential resource of enormous value for humanity's future. Here again, the environmental risks and technological difficulties associated with exploitation would be substantial; so far only a few feasibility studies have been conducted, along with some experiments involving towing icebergs for short distances at sea.

Tourism. Antarctica's only important potential resources are natural ones: since the continent is virtually uninhabited, there are no significant economic activities associated with its population. In recent years, however, amid controversy, a certain amount of commercial tourist development has appeared on the Antarctic scene. Sailors and adventurers are challenging the Southern Ocean in pleasure boats, and tour operators are taking cruise ships through the magnificent scenery of the Antarctic Peninsula and sometimes into the Ross Sea. The first Antarctic hotel has been built on a Chilean base, and a few sightseeing flights have flown over the continent, although there is no air traffic control system and such flights ended in 1976 after a tragic accident on Mt. Erebus. In recent years, several thousand tourists have visited Antarctica briefly during the short southern summer. Only a few countries are encouraging Antarctic tourism; the majority firmly oppose it, regarding it as a serious environmental threat and a disruption to scientific research, which is by far the prevalent activity on the continent.

Subdivisions and spheres of influence. Antarctica's international status is unique: the continent is undivided and accessible to all. Historically, seven countries have laid claim to Antarctic territories, in the form of sectors defined by lines of longitude and converging on the South Pole. Since 1908, when Great Britain claimed the sector containing the Antarctic Peninsula, Argentina, Australia, Chile, France, Norway, and New Zealand have advanced territorial claims. The sectors claimed by Argentina and Chile overlap one another as well as the British sector, and Australia claims an enormous sector equivalent to 43% of the continent. In addition, in the 1950s the United States and the Soviet Union reserved their own "rights" on the Antarctic continent, without declaring sovereignty over specific territories.

International law confers no validity on these national claims to territories which the claimant nations themselves are not capable of occupying. The international community has essentially ignored these aspirations, since only five of the world's 170 countries have recognized other nations' claims.

The positive experience of the International Geophysical Year of 1957–58, when all the countries with Antarctic interests coop-

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New Zealand	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]
Argentina	[illegible]	[illegible]
Australia	[illegible]	[illegible]
Chile	1961	1961
Czechoslovakia (*)	1962	
Denmark	1965	
Netherlands	1967	1990
Romania	1971	
Germany, East (**)	1974	1987
Brazil	1975	1983
Bulgaria	1978	
Germany, West (**)	1979	1981
Uruguay	1980	1985
Papua New Guinea	1981	
Italy	1981	1987

erated to explore the continent and had access to an undivided Antarctica, led to the Antarctic Treaty signed in 1959 (enacted in 1961), which at present constitutes the actual international instrument governing the Antarctic region. It was originally signed by 12 governments, including all the territorial claimants and the two superpowers; to date 40 have acceded to it. Treaty signatories include both global and regional powers—the United States, the former Soviet Union, China, India, Japan, Brazil, Germany—and other countries, representing more than 80% of humanity. Prior claims are neither recognized nor refuted in the treaty, but it prohibits any new claims. The Antarctic Treaty does not definitively resolve the principal political question, namely that of sovereignty over Antarctica: it merely "freezes" it, and thus keeps potential conflicts frozen as well.

The Treaty prohibits the militarization of Antarctica and the use of nuclear weapons, and promotes international cooperation in the activity of greatest interest: scientific research. The result has been to ensure a state of peace in the Antarctic region, despite its considerable strategic importance. In its first thirty years the Antarctic Treaty has spawned a huge body of regulations that have largely been enacted to preserve natural resources and protect the natural environment; the Treaty is bolstered by other international agreements concerning natural resources and environmental protection.

Nevertheless, the Antarctic Treaty binds only those countries that have signed it; others do not agree that Antarctic questions are to be settled exclusively by reference to the Treaty, and have taken the debate to the United Nations. According to an idea acknowledged in UN resolutions, the Antarctic, like the ocean depths or other planets, constitutes a common territory that cannot be appropriated by individual nations, and its resources are the common property of humanity. Under this theory, Antarctica and its resources must not be divided up, but must be managed internationally. The Protocol on Environmental Protection of 1991 contains the principles and standards to be observed in the conduct of all activities in Antarctica.

Here are a few salient passages from the Antarctic Treaty:

> *The Governments of Argentina, Australia, Belgium, Chile, the French Republic, Japan, New Zealand, Norway, the Union of South Africa, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America,*
>
> *Recognizing that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord ...*
>
> *Have agreed as follows:*

Article I

> *1. Antarctica shall be used for peaceful purposes only. There shall be prohibited, inter alia, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military maneuvers, as well as the testing of any types of weapons.*

2. The present Treaty shall not prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose....

Article IX

1. Representatives of the Contracting Parties named in the preamble to the present Treaty shall meet ... for the purpose of exchanging information, consulting together on matters of common interest pertaining to Antarctica, and formulating and considering, and recommending to their Governments, measures in furtherance of the principles and objectives of the Treaty, including measures regarding:

1) use of Antarctica for peaceful purposes only;
2) facilitation of scientific research in Antarctica;
3) facilitation of international scientific cooperation in Antarctica;
4) facilitation of the exercise of the rights of inspection provided for in Article VII of the Treaty;
5) questions relating to the exercise of jurisdiction in Antarctica;
6) preservation and conservation of living resources in Antarctica.

The Protocol on Environmental Policy of 1991 includes the following passages:

The States Parties to this Protocol ...

Convinced of the need to enhance the protection of the Antarctic environment and dependent and associated ecosystems ...

Recalling the designation of Antarctica as a Special Conservation Area and other measures adopted under the Antarctic Treaty system to protect the Antarctic environment and dependent and associated ecosystems;

Acknowledging further the unique opportunities Antarctica offers for scientific monitoring of and research on processes of global as well as regional importance; ...

Convinced that the development of a comprehensive regime for the protection of the Antarctic environment and dependent and associated ecosystems is in the interest of mankind as a whole; ...

Have agreed as follows:

Article 2.

... The Parties commit themselves to the comprehensive protection of the Antarctic environment and dependent and associated ecosystems and hereby designate Antarctica as a natural reserve, devoted to peace and science.

Article 3.

... The protection of the Antarctic environment ... and the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research, in particular research essential to understanding the global environment, shall be fundamental considerations in the planning and conduct of all activities in the Antarctic Treaty area.

An example of one of the more recent signatories of the Antarctic Treaty is Italy, which had a prior tradition of polar exploration in the Arctic but not the Antarctic, and has been present on the continent since 1985. Annual Italian expeditions involve over a hundred technicians and researchers who undertake scientific investigations of the polar upper atmosphere (studying ozone loss), the geology of the Transantarctic Mountains, biology, marine ecology, the oceanography of the Southern Ocean, environmental characteristics of water and ice, and a number of other subjects of importance for polar and global science.

Polar Regions

Images

1. *Two splendid specimens of the polar bear, the largest carnivore of the Arctic regions and a symbol of the animal species that manage to survive in the harsh polar climate and environment. It has also given the name "Arctic" to the north polar region of the world: the Greeks used the word* arktos, *or the "Little Bear," to identify what is called in English the Little Dipper, containing the North Star toward which the Earth's rotation axis seems to point.*

2. *Eighty percent of Greenland, the Danish island located in the northwest Atlantic between the Canadian Arctic and the islands of Spitsbergen and Iceland, is covered by an immense ice cap 10,000 ft [3000 m] thick in some places. The "raised beaches" resulting from isostatic glacial elevation are another characteristic phenomenon.*

3. *Icebergs, which float and drift on the ocean, are formed essentially as a result of the disintegration of polar glaciers that descend from the edge of the Arctic ice cap and break up into these magnificent blocks of ice, which can often represent a serious hazard to shipping.*

4. *Ships traveling the legendary Northwest Passage, long sought by polar explorers since the 16th century, when the idea emerged of communication by sea from the Atlantic to eastern Asia by sailing west. After many years of expeditions, beset by cold and navigation difficulties, the passage was finally proved to exist in the mid-19th century but not actually navigated until over half a century later when the Norwegian explorer Roald Amundsen successfully made the journey (1903–06).*

5. *A haunting image of the aurora borealis, photographed near Fairbanks, Alaska. The "northern lights" illuminate the night sky at high latitudes, creating arcs, circles, lines, bands, and curtains of light on the horizon, in colors from blue to red and green. They are caused by interaction between electrically charged subatomic particles ejected by the Sun and the atoms and molecules present in the Earth's ionosphere at altitudes above 60 mi [100 km].*

6. *Perpetually frozen subsoil (permafrost) limits Arctic vegetation to the typical tundra forms, with more than 400 species of mosses and lichens, most importantly* Cladonia *(reindeer moss), the basic food of reindeer and caribou. There are also a few areas of meadow and isolated groves of broadleaf trees, especially beeches, perhaps survivors of a more extensive forest cover in past ages.*

7. *A small group of walruses enlivens the monotonous panorama of the Arctic Ocean. One of several species of* Odobenus *mammals inhabiting the Arctic, the walrus is declining in numbers due to past hunting by humans, who used their blubber, skins, and ivory tusks*

8. *Two Greenland or "harp" seals, so called from the dark brown or black crescent, harp-like patch on the backs of adult males; in females, this marking takes the form of grayish-black spots. Like all other Arctic animal species, seals are protected by international regulations.*

9. *The main means of land transportation used by Arctic peoples to travel over the immense stretches of ice that cover the northern polar region is the sled, drawn by reindeer or more commonly by dogs called "huskies," the only draft animals capable of withstanding local temperatures which often dip to –60°F [–50°C]. Air and sea links and their airport and harbor facilities, extensively used by tourists during the summer months, are also sure to assume increasing importance in international communications.*

10. *An old Eskimo woman. The native population living in the part of the Arctic that does not belong to Russia is represented principally by Eskimos. Only in the recent past have these people come into contact with Europeans, who have settled in these areas for commercial purposes and to conduct scientific research and mineral exploration.*

11. *An Eskimo from the Canadian Far North fashions a sculpture of two polar bears. The extreme rarity of these animals in the polar region, and their valiant struggle for survival paralleling that of humans, have made them a popular subject for artists.*

12. *Continual migrations in the past, motivated by the need to find food by hunting, now make it difficult to determine the origins of the Eskimos, a people with Mongoloid traits who have lived in the Arctic for at least 2000 years. Although they are quite homogeneous in terms of language and geographic provenience, the Eskimos belong to distinct "nations" with specific characteristics.*

13. *Two Eskimo children play*

with a handmade wooden sled on the ice surrounding Delo airfield in the western Arctic. Even in the most remote villages, the Eskimos have built rudimentary landing strips and moorings accessible to Coast Guard icebreakers or amphibious vessels transporting provisions, so as to maintain constant contact with other geographic regions and find relief from their isolation.

14. *Houses around the little harbor settlement of Holsteinsborg on the west coast of Greenland. Recent contact with colonists and missionaries from Denmark and Scandinavia has led the local Eskimos, still the prevalent ethnic group, to abandon their traditional igloos and live in modern villages, usually scattered along the coasts.*

15. *Nighttime view of an* igloo *in the Canadian Arctic. Hemispherical in shape, these traditional Eskimo dwellings are built of square blocks of packed snow, or have structural frames, often made of whalebone, covered with snow. It has been only since the arrival of Europeans that Arctic natives have begun to prefer houses made of wood, and with them a much more sedentary way of life than their previous existence based on hunting and fishing.*

16. *One of the principal economic resources of the Arctic region, along with fishing and hunting, is the herding of reindeer. These ruminants, with their short, dense coats, have been domesticated by the Lapps and other Eurasian Arctic peoples as draft animals and for their milk and meat, as well as for the precious skins they yield.*

17. *A small fishing boat threads its way between two icebergs floating on the icy seas around Greenland. Since 1831, explorers throughout the world dreamed of crossing the North Pole; the feat was finally accomplished, beneath the ice, by the American nuclear-powered submarine* Nautilus *in the summer of 1958.*

18. *Flags from around the world fly at the spot on the Antarctic continent marked as the geographic South Pole. International cooperation has made Antarctica an unexpected success story in the history of international relations, based on the scientific research and environmental protection principles laid down in the Antarctic Treaty that took effect in 1961, and on a series of later agreements.*

19. *The Transantarctic Mountains, seen from the air near Victoria Land. The geographic layout of Antarctica is usually described as a subdivision into two major regions, West and East, separated by the depressions of the Ross and Weddell Seas along which the Transantarctic range runs for 2500 mi [4000 km].*

20. *The majestic profile of volcanic Mt. Erebus, still active, and located on Ross Island in the Ross Sea. This volcanic island is made up of no fewer than four cones, the largest of which, Erebus, rises to an elevation of more than 12,000 ft [3700 m] and is 2600 ft [800 m] across.*

21. *An icebreaker noses into the Antarctic Ocean, cutting through the pack ice—the thin layer of permanent ice that covers much of the ocean's surface and in winter seamlessly welds together the land areas of the Antarctic basin. Although temperatures are almost always below freezing, the deep water remains liquid because of its high salt content, which considerably lowers its freezing point.*

22. *The famous "midnight Sun" symbolizes the profound climatic differences between the polar regions and other latitudes of the globe: day and night each last several months, with about one transitional month of twilight occurring twice a year. Antarctica is the coldest continent on Earth, with average temperatures of about −85°F [−65°C] between April and September, rising to −22°F [−30°C] between December and February.*

23. *One of the rarest seabird species in the Antarctic is the emperor penguin, which spends the winter in small flocks on the sea ice. Many thousands of years ago penguins were almost certainly expert fliers, but their wings slowly evolved into flippers as an adaptation to the need to feed on fish.*

24. *The waters of the Southern Ocean are rich in small herbivorous planktonic crustaceans known collectively as krill, which migrate slowly in uncountable numbers, especially in the pack-ice region. Classified into about a dozen species, krill are vital to the existence of all higher animals that feed on them directly or indirectly. They are also attracting attention from biologists, concerned about the incalculable effects on the entire ecosystem of indiscriminate krill fishing on an industrial scale.*

25. *The islands surrounding the Antarctic continent are inhabited by huge numbers of Adelie penguins, seabirds which are distinguished from the more common penguin species by their pointed conical heads and short black and red beaks. They usually live in colonies that can sometimes exceed 300,000 individuals.*

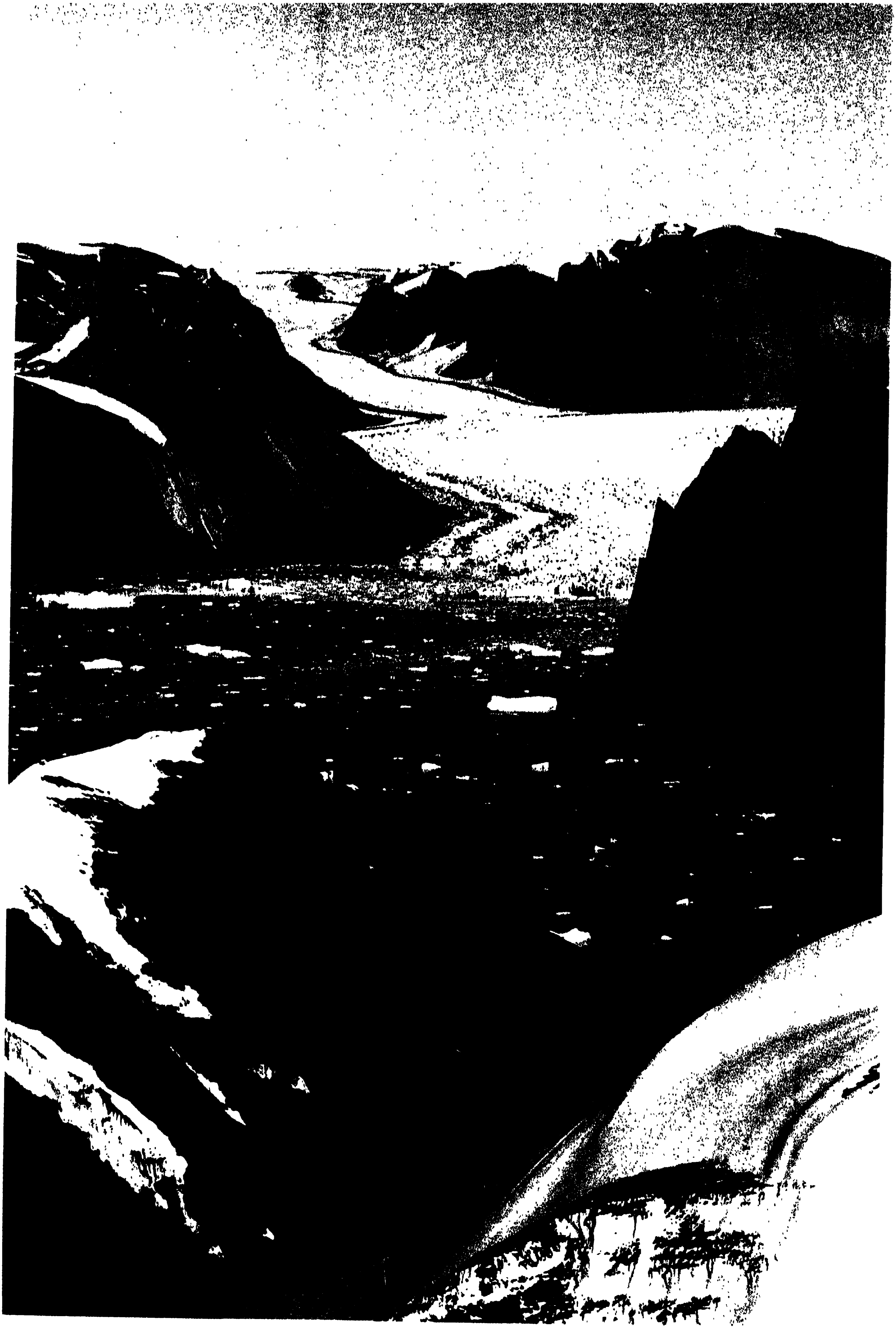
26. *The elephant seal, along with the leopard seal, is one of the largest Antarctic mammals, identified by the bizarre pendulous proboscis above its mouth. It can grow to a length of more than 20 ft [6 m] and can weigh over three tons; it needs to eat at least 200 lb [100 kg] of fish a day.*

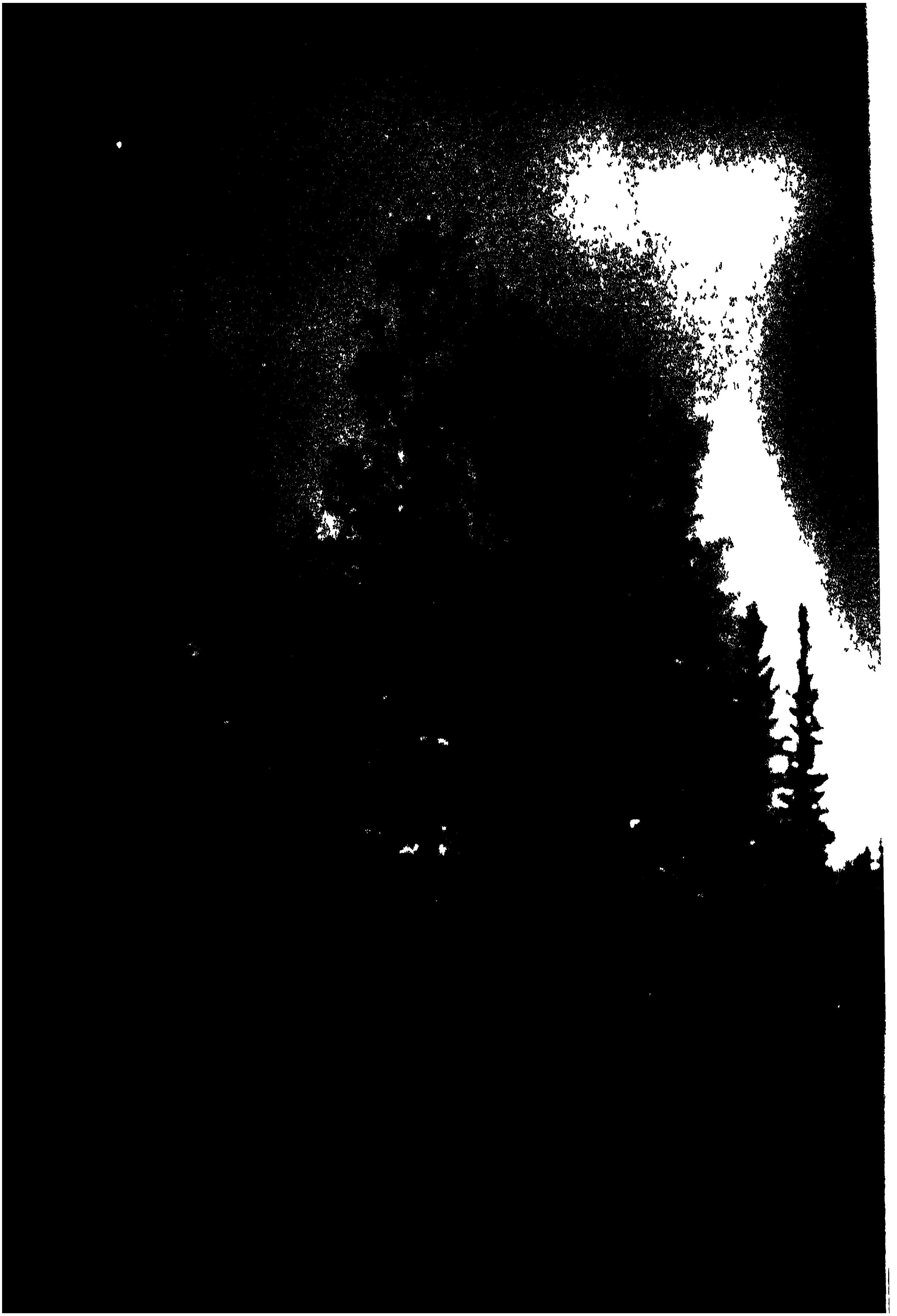
27. *A Weddell seal, the typical Antarctic seal, has white and yellowish spots on its back and fur tipped with silver. Antarctic seal populations are steadily rising, since the principal competing marine species, especially the great whales, have declined enormously due to hunting by humans.*

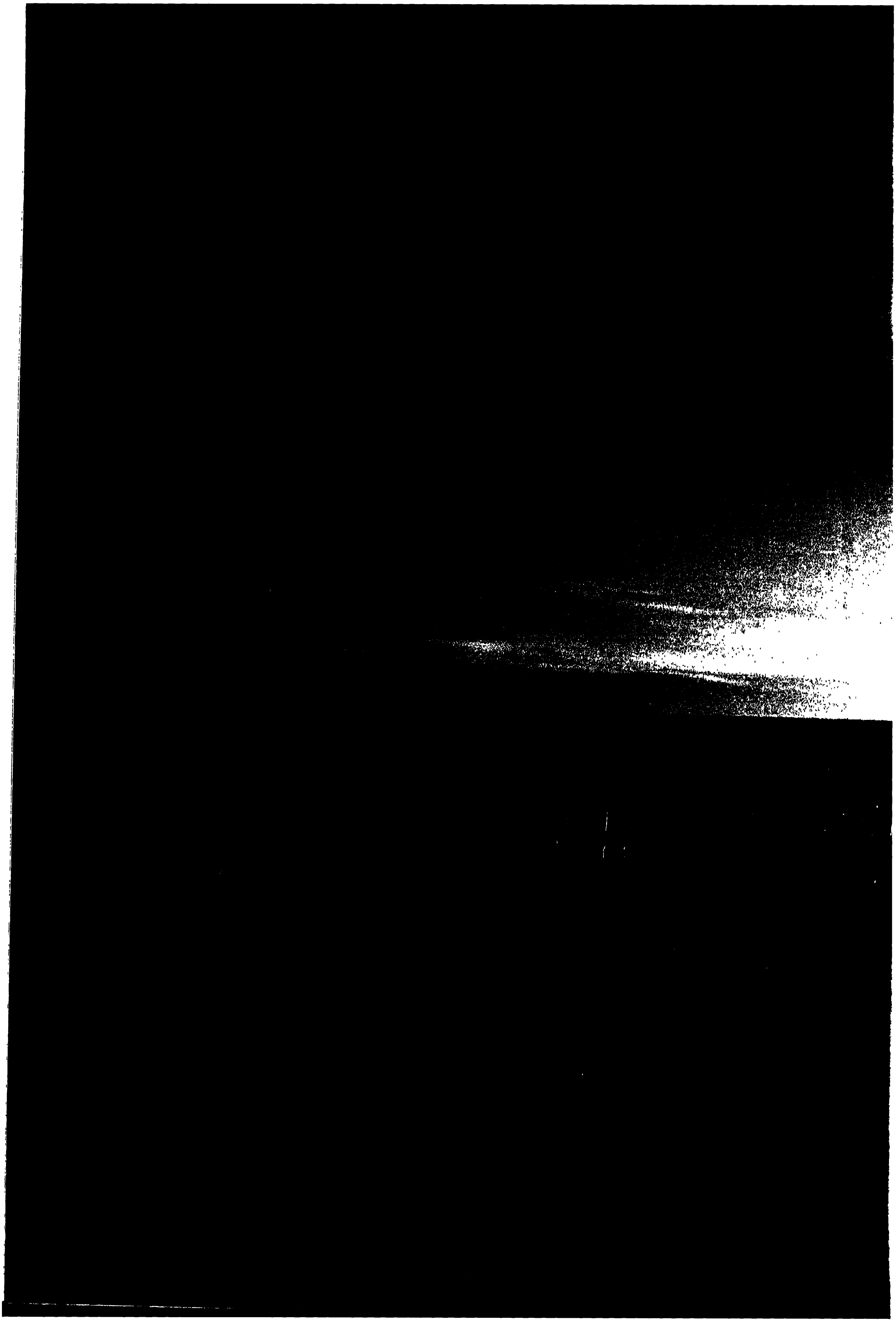
28. *Among the millions of birds that soar through the twilight of the Antarctic glaciers, it is not unusual to see the common skua in search of food. The extremely cold climate that dominates the Antarctic landmass is not felt with such intensity in the sea, which is therefore extremely rich in animal life.*

29. *Group photograph of delegates from the nations participating in the Antarctic Treaty, promulgated in 1959 and in force since 1961. Although the Treaty, which now includes 40 signatory nations, is the only collection of regulatory standards acknowledged to have international validity, it does not definitively resolve the delicate question of political sovereignty over Antarctic territory.*

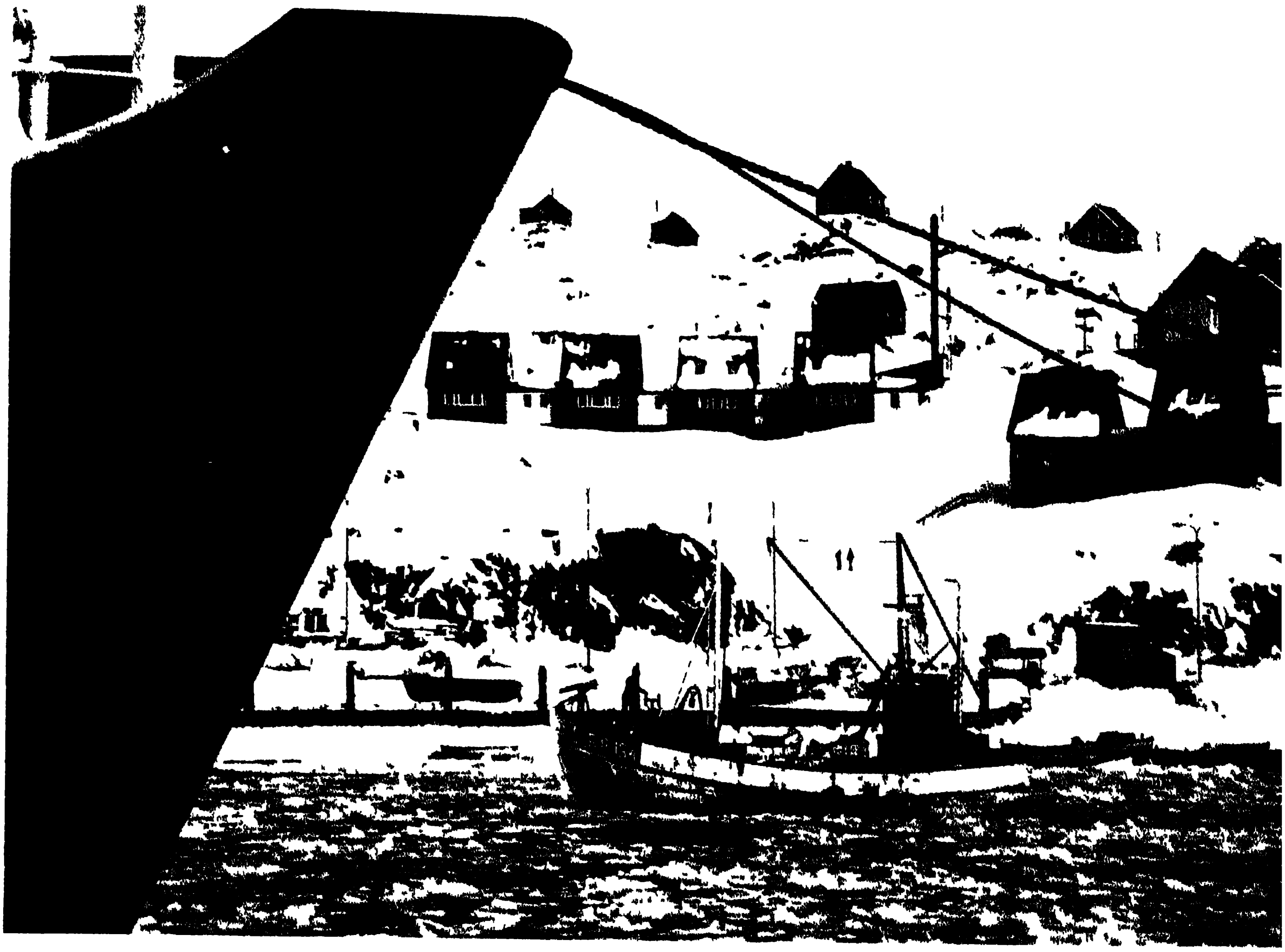
30. *Aerial view of the German Antarctic base named for Georg von Neumayr. In many cases, the selection of appropriate sites for the construction of scientific stations and the air strips associated with them dates back to the occasion of the International Geophysical Year proclaimed in 1957–58, when groups of scientists from all over the world explored hitherto unknown areas of the Antarctic, bringing back results of considerable value. The hostility of Antarctica's environment and climate greatly affects the human presence there, reducing it often to a bare minimum of scientific camps designed to house a limited number of people.*



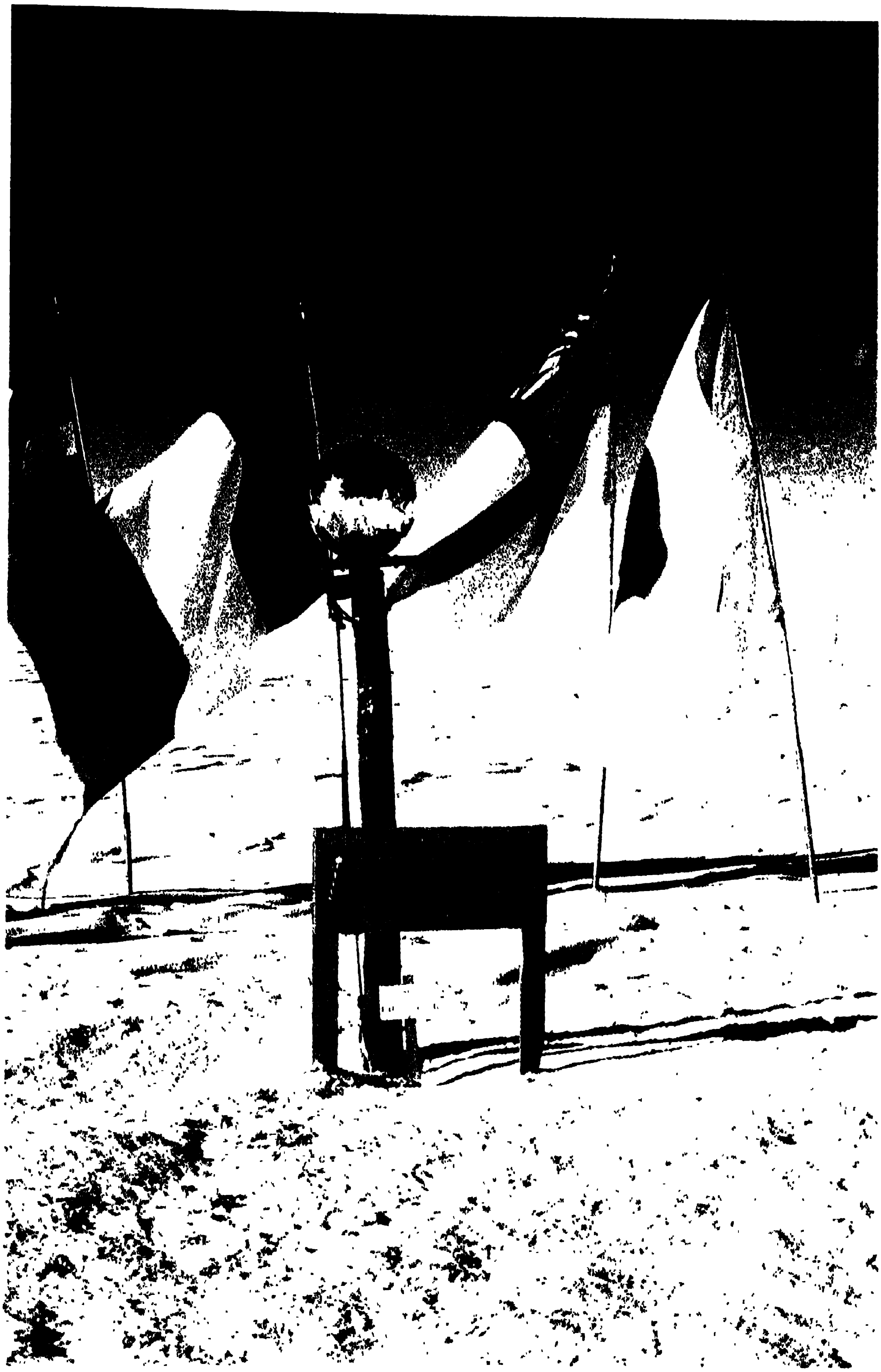


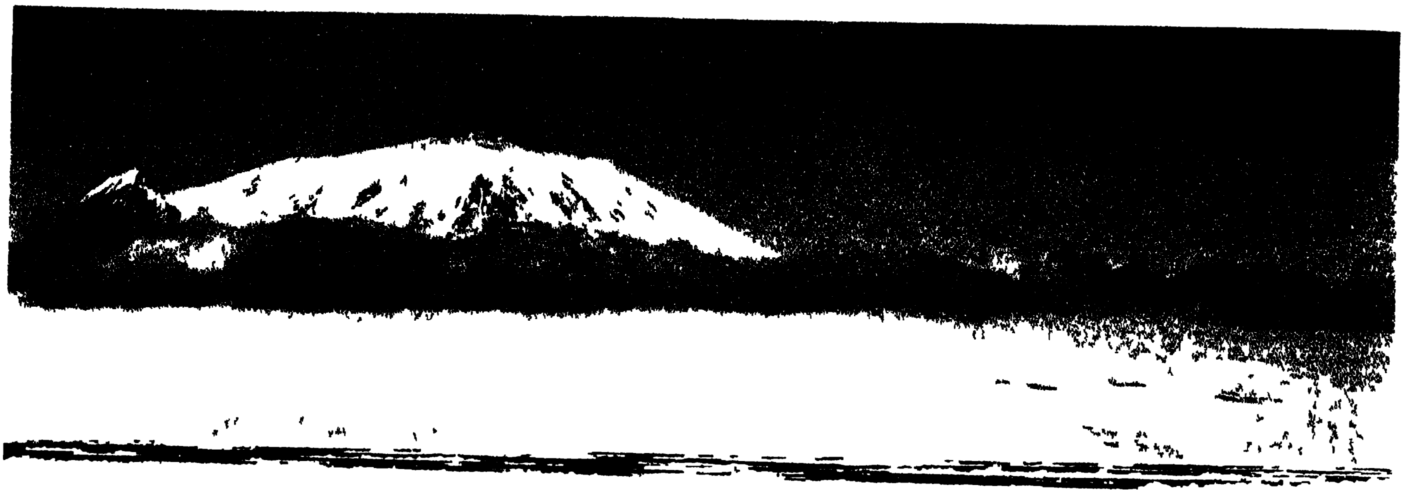


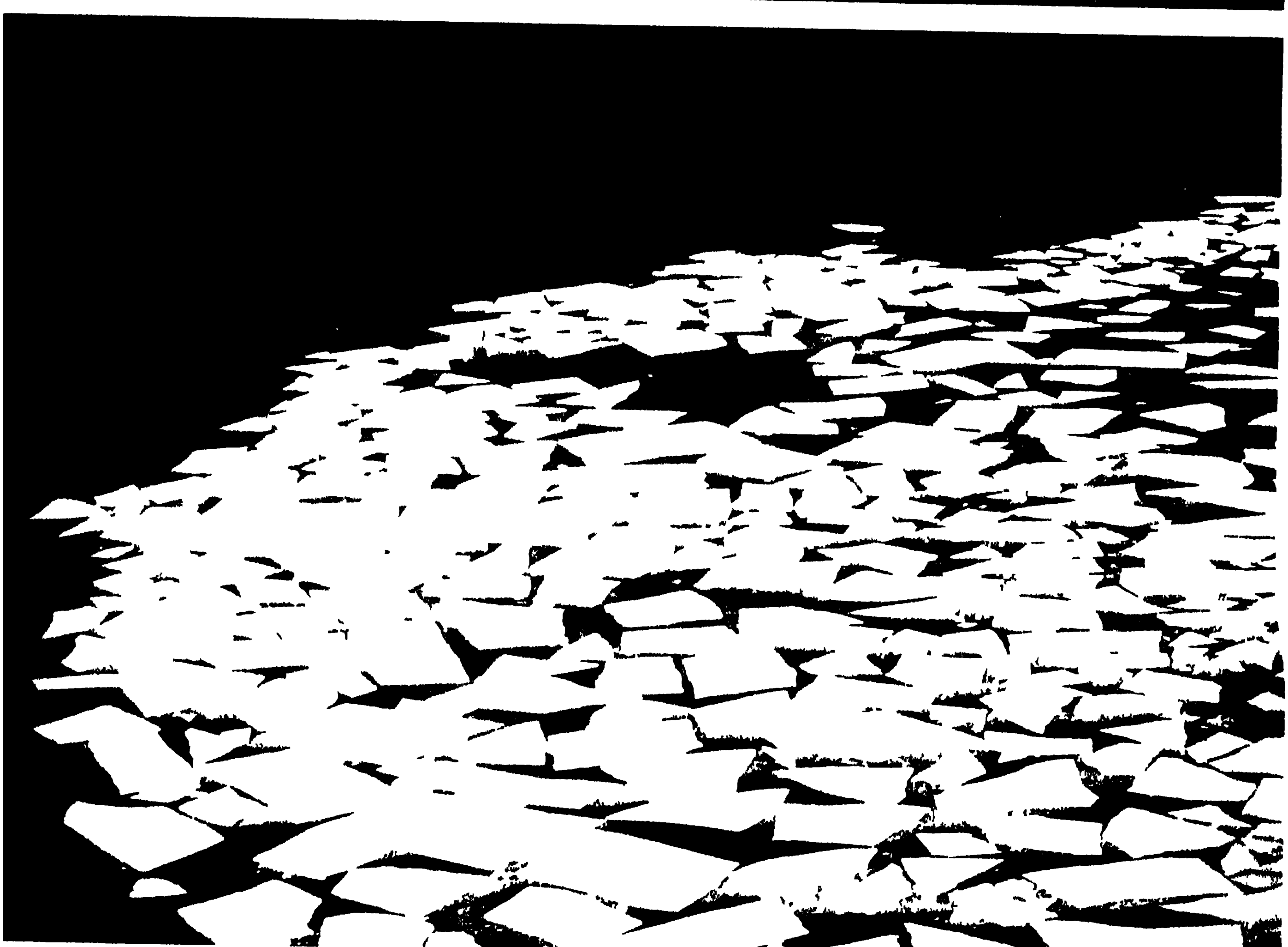


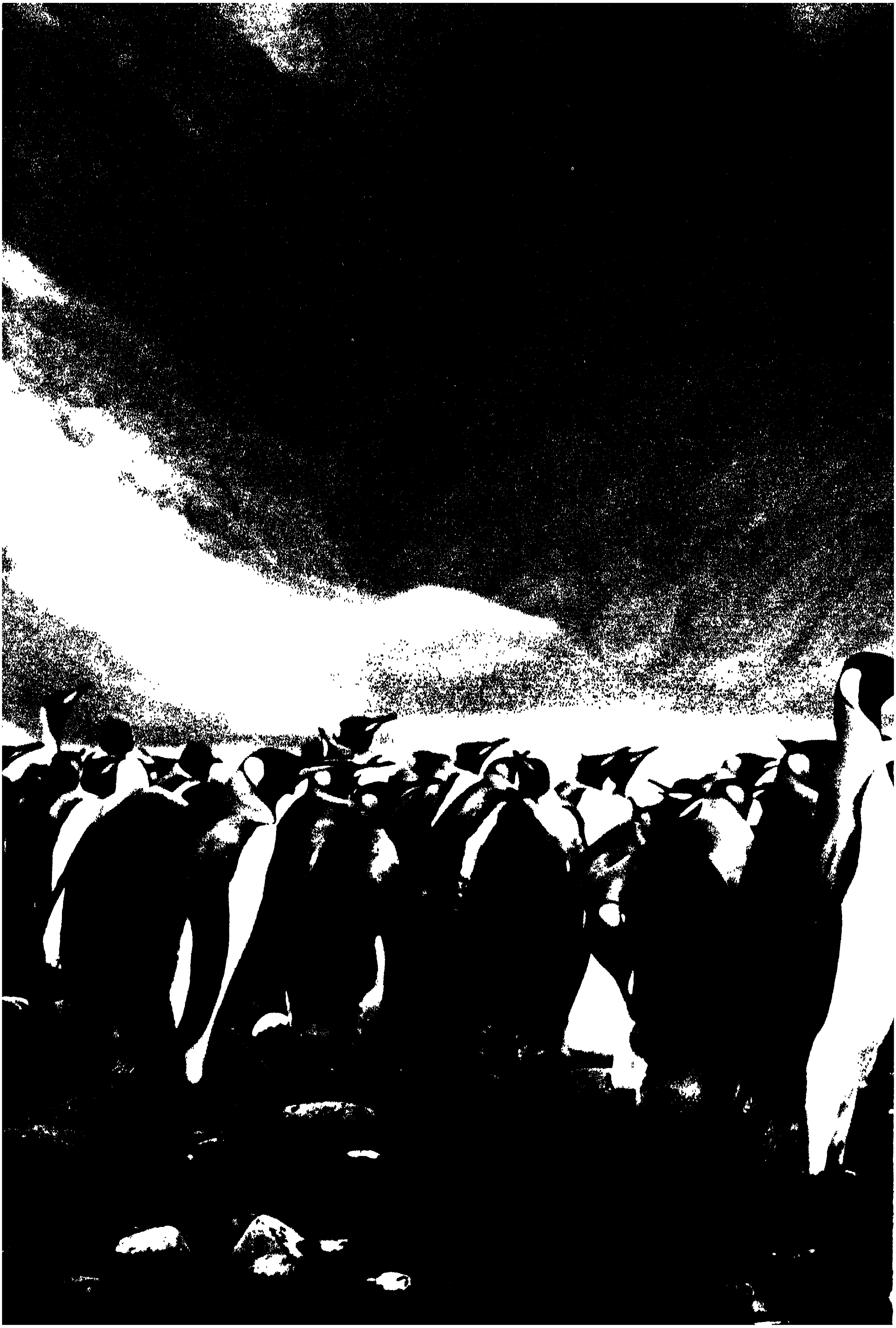



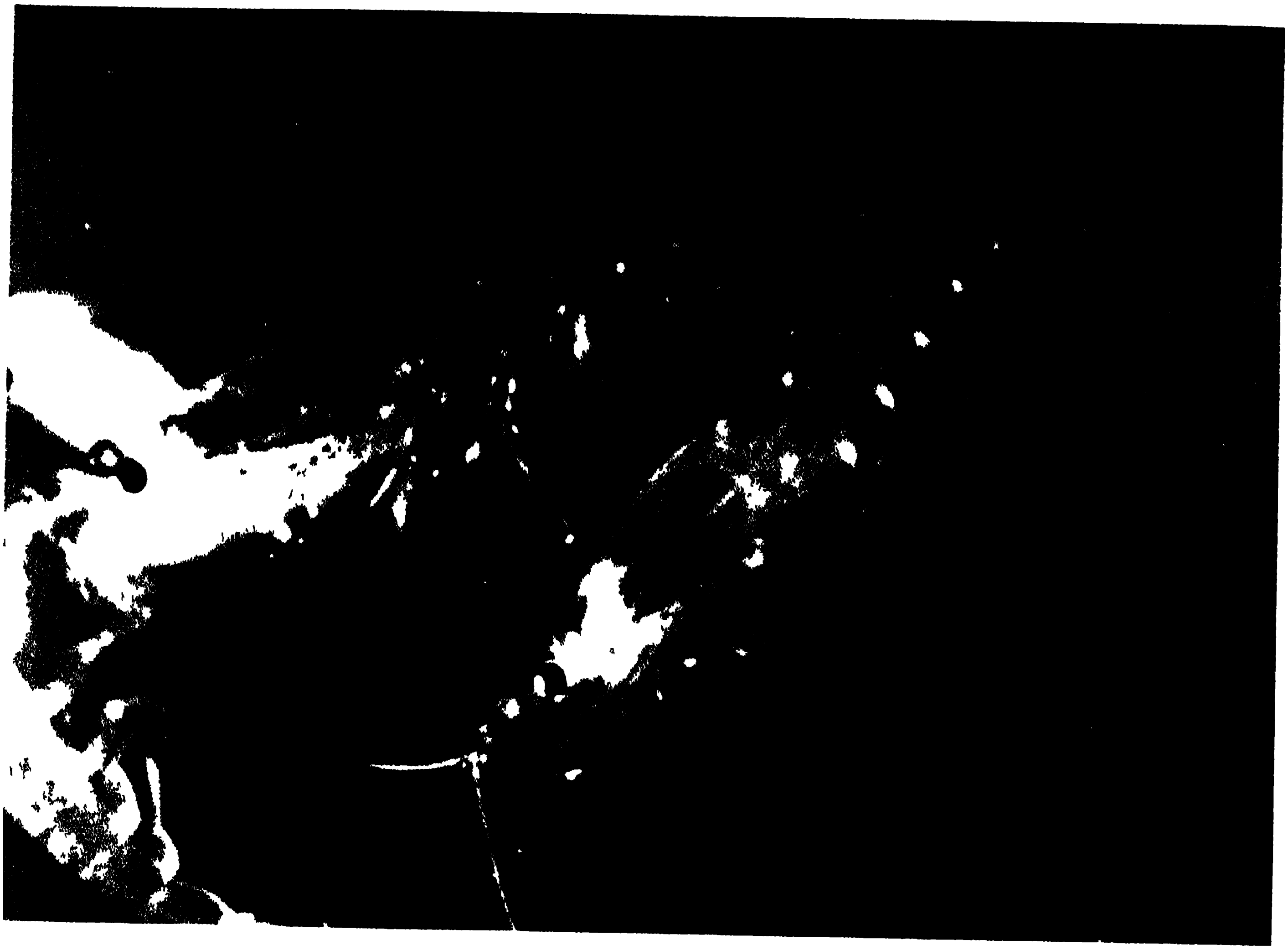
Antarctica

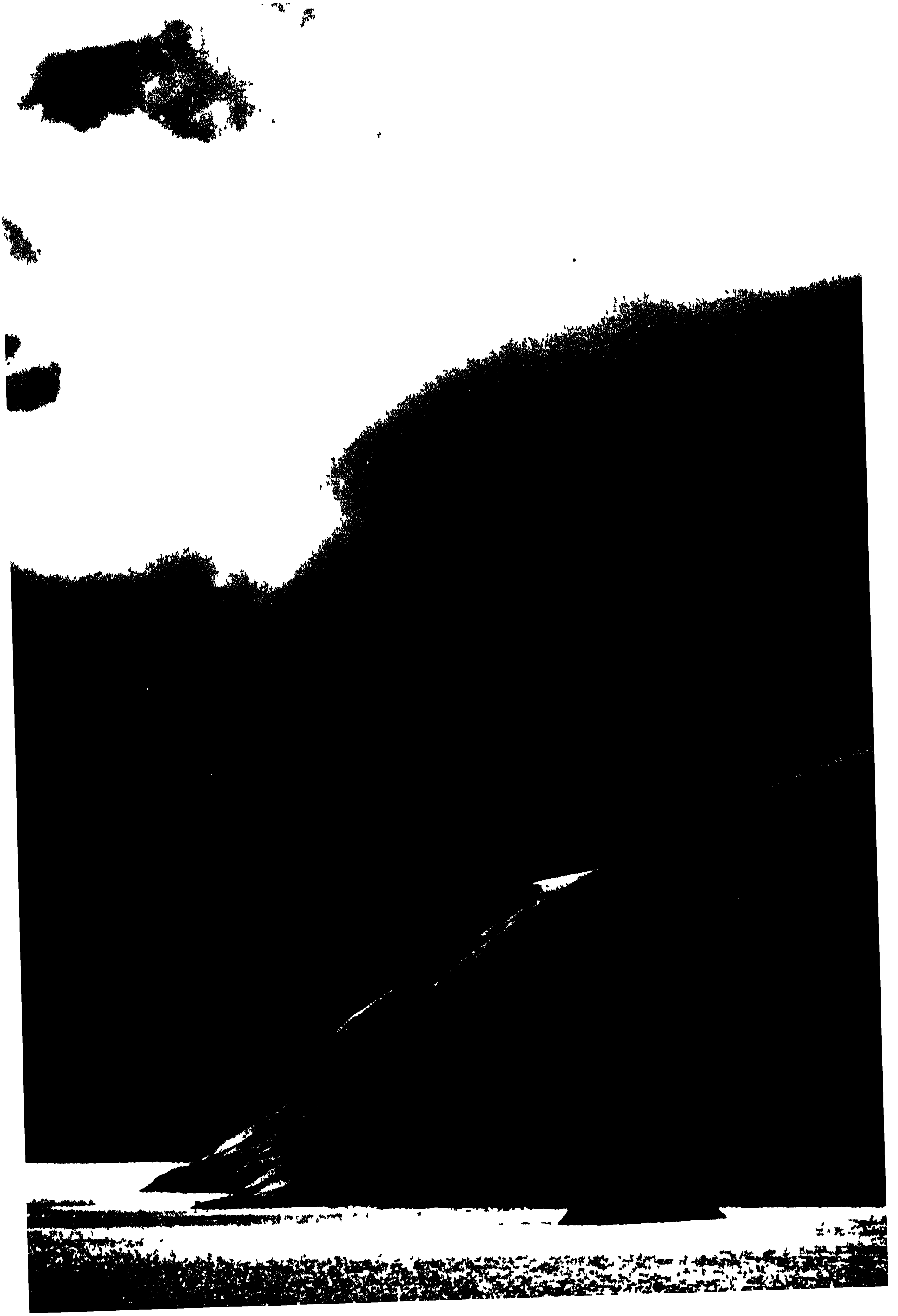


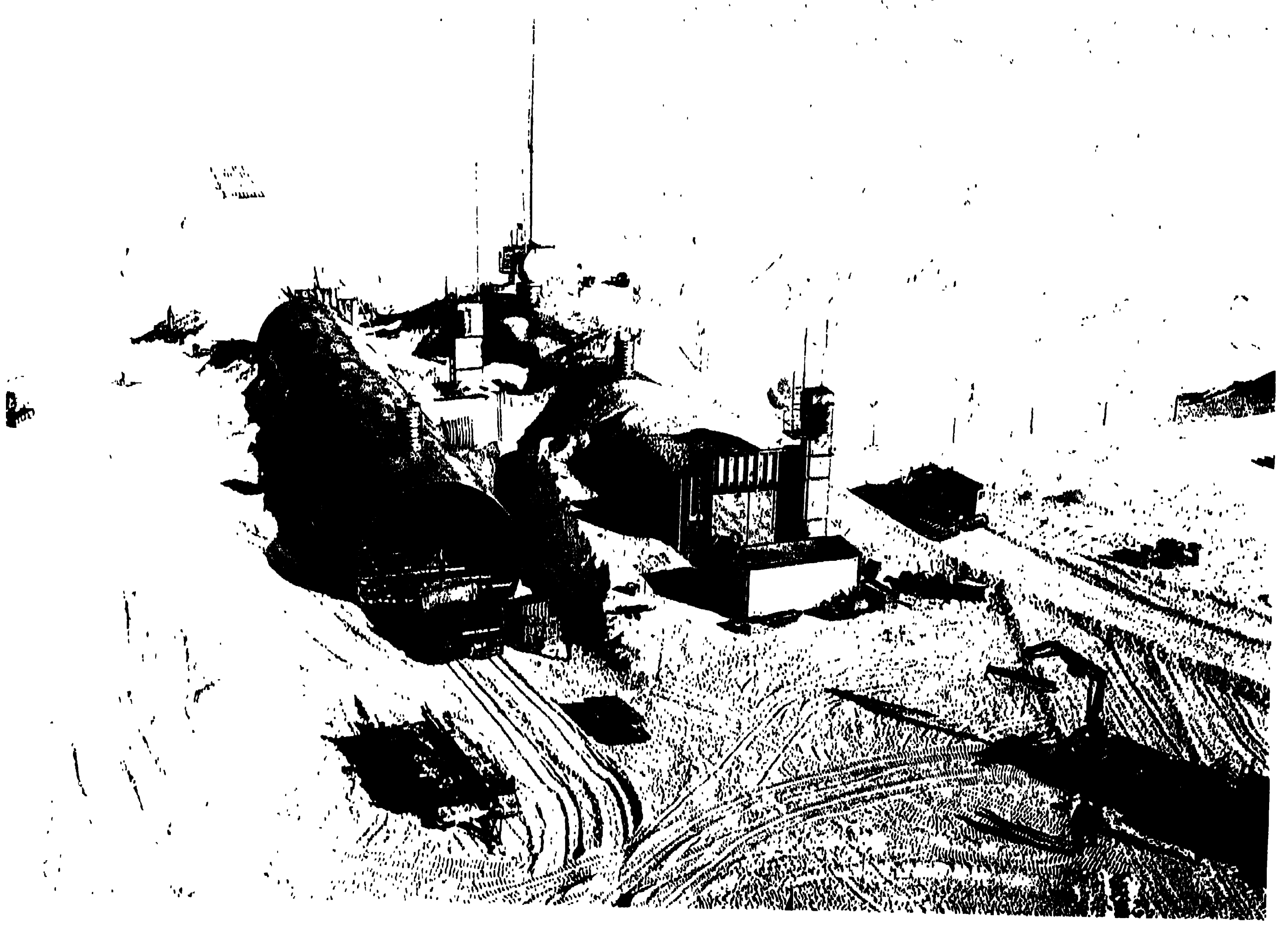












GENERAL GEOGRAPHY

In the infancy of cultural history, geography originated as a branch of cosmography, or that science which studied the entire universe (Greek *kosmos*) observable by human beings. And considerable attention was always devoted to the study of the heavenly bodies that surrounded our Earth in the realm of the skies. Both cosmographers and even the most primitive cultures have always believed the real or apparent motion of the stars to be the cause of many specific conditions observable on Earth, and have attempted to explain them in religious or scientific terms.

THE PLANET

The motions of the Sun in particular, the most brilliant star in our sky and often regarded as divine, were naturally made responsible for the alternation of day and night, and for the seasons and therefore climatic variations as well. Its apparent motion around the Earth, like the motion of all the stars, was the source of the geocentric concept of the universe that is found in every culture, and that endured in Western civilization until the time of Kepler, Copernicus, and Galileo.

The Moon, so mysterious in the sequence of its phases, was believed to exert both beneficent and evil influences on humans and on every other living thing, in particular on fertility. Its phases also offered humans a division of time (into lunar months) subordinate to the solar year.

The inexplicable changes in the movements of our satellite and of the planets of the solar system as compared to those of the "fixed" stars gave rise to mechanistic theories, the most famous of which (and the one most adhered to by Western astronomy until the beginning of the contemporary era) was the Aristotelian idea of the celestial spheres, rotating around the Earth at different rates and on different axes. In some languages the ageless fascination with the various heavenly bodies is reflected in the names of the days of the week (in English, Sunday and Monday, for example).

The spherical shape of the Earth has also been a part of human knowledge for millennia, more by analogy with the shape of the visible planets than by true experimentation. The first irrefutable demonstration that the Earth was round came with the first circumnavigation of the globe by Magellan in the 16th century. And it was only in the 17th and 18th centuries that astronomical, geophysical, geodetic, and climatological knowledge began to take scientific shape, giving impetus, once the entire Earth's surface had been explored, to the modern adventure of space travel.

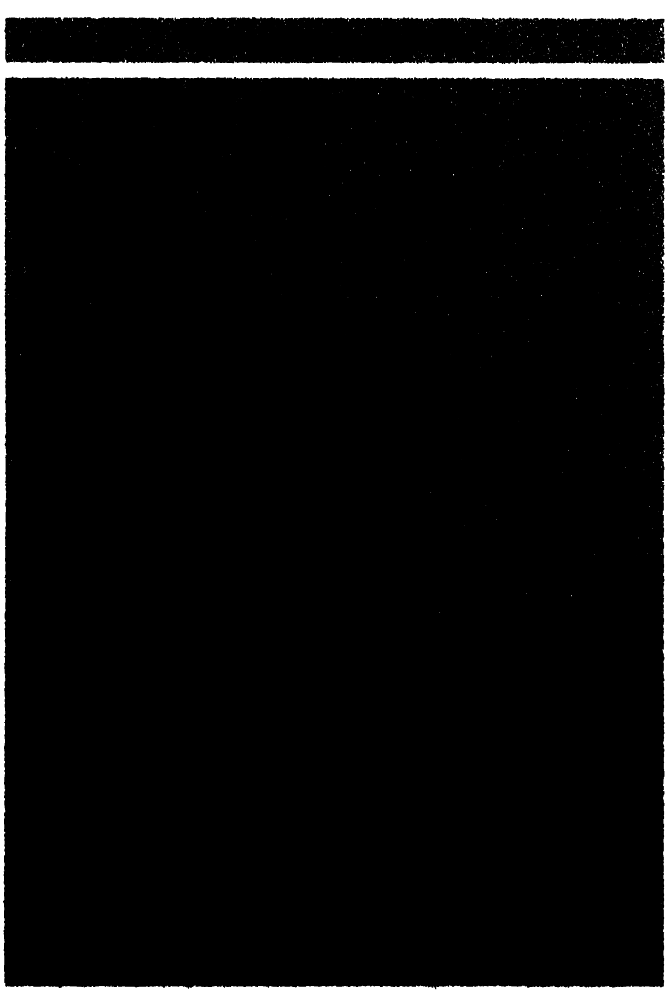
The Earth within the solar system. The Earth, it was discovered, is not at the center of the universe, but is only one of nine planets revolving in elliptical orbits around the Sun, constituting a heliocentric grouping (the solar system). The Sun in turn is just one star (and a rather small and dim one) among the billions that make up the Milky Way, one of innumerable galaxies that populate the universe. Our galaxy was named for the fact that it appears in our night sky as a long milky trail of particularly densely packed stars. The Earth is approximately 93 million mi [150 million km] from the Sun; only Mercury and Venus are closer, and the other six planets are much farther away. Pluto, the most remote, lies at a distance of over 3.6 billion mi [5.9 billion km]. The Earth is the fifth largest of the Sun's planets, with a diameter of about 7750 mi [12,500 km].

The distances between the Sun and the other stars of our galaxy are enormous, so great that they cannot be measured in miles or kilometers (one kilometer is, by definition, one forty-thousandth of the Earth's circumference), but in light-years, equivalent to the distance covered in one year by light traveling in the cosmic vacuum (light travels about 186,000 mi [300,000 km] in one second, and 5.87 billion mi [9.46 billion km] in a year). Although the Sun's light reaches us in a little over 8 minutes, there are stars in our galaxy whose light takes millions of years to arrive. By the time we observe them they have already disappeared.

The Sun is a spherical mass of incandescent material, fluid on its surface (photosphere), where its temperature is almost 11,000°F [6000°C]. Its diameter is 110 times greater than that of the Earth, and its volume 1.3 million times larger. The gravitational force exerted on the Earth by the enormous mass of the Sun is responsible for our planet's revolution around the star, which occurs in an elliptical orbit according to laws that were defined by Isaac Newton, discoverer of the force of gravity.

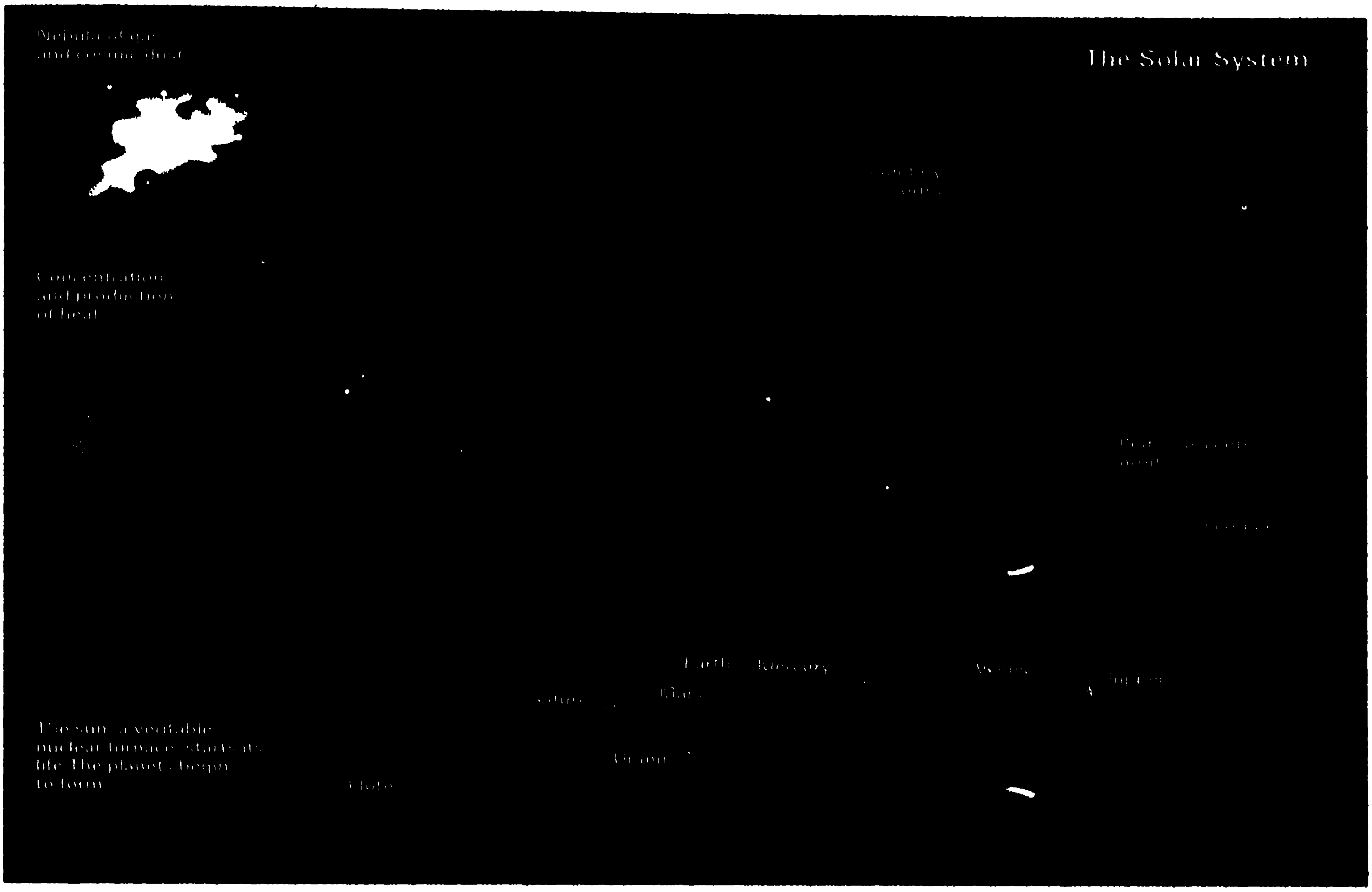
Only a tiny fraction of the immense quantity of light and heat radiated by the Sun reaches the Earth, although even that is sufficient to sustain the life of all the animal and plant species that live on it. This is due in part to the relatively short time (24 hours) required for the Earth to rotate once around its own axis, which results in relatively short periods of exposure to the Sun's heat by day and to the cold of night. Moreover, the inclination of the Earth's axis with respect to the plane along which it orbits around the Sun causes changes in the Earth's exposure to solar radiation over the course of the solar year, producing the progression of the seasons.

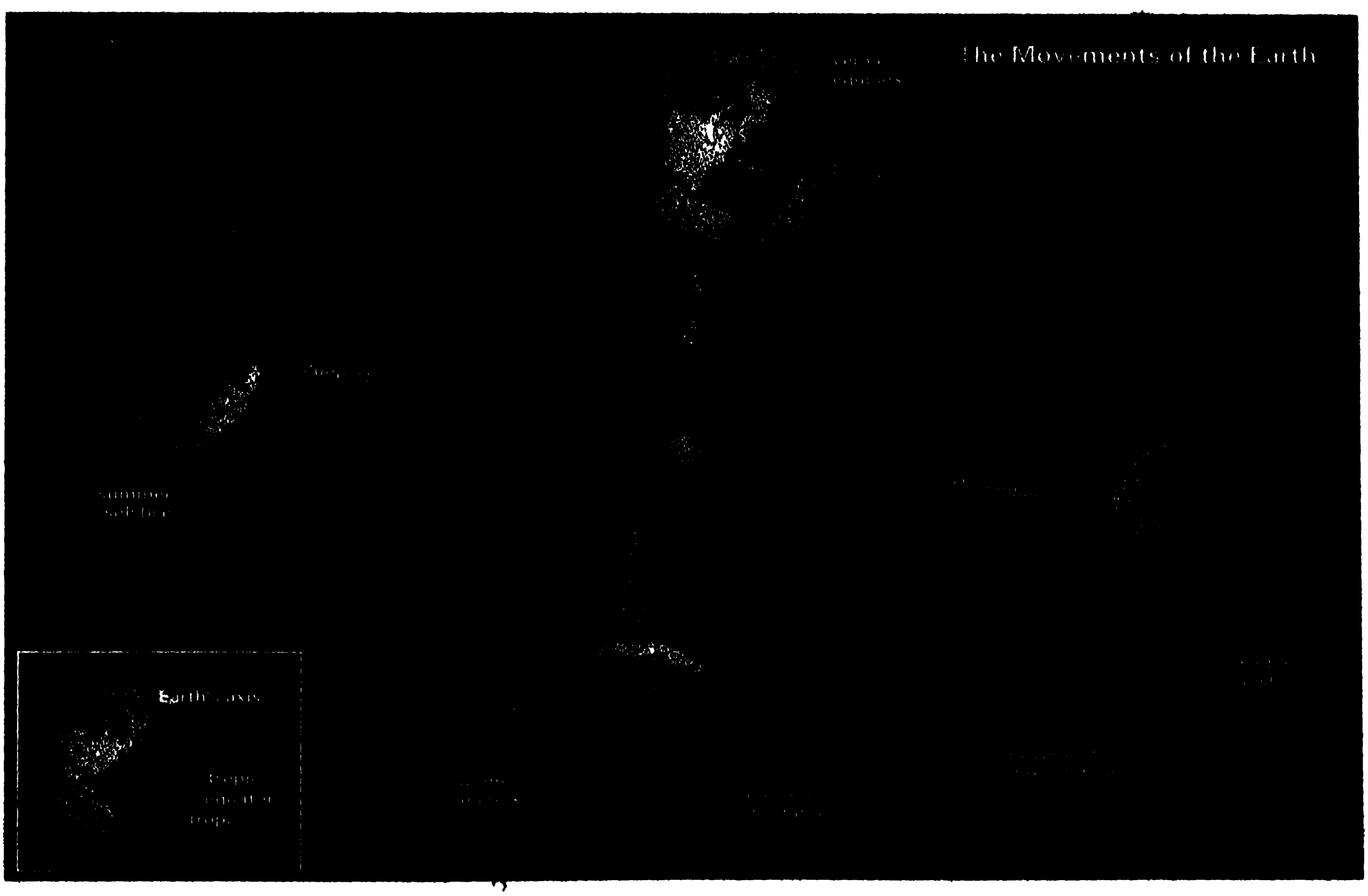
The Moon is worthy of particular mention: it is the Earth's only satellite, that is, an object held captive by the gravitational field of our planet and therefore subject to two motions: rotation about its own axis, and revolution around the Earth. A peculiarity of these two motions is that they have the same period: 29 days, 12 hours, 44 minutes (the "lunar month"). As a result, the Moon always turns the same face toward the Earth, so that day and night on the Moon are each almost 15 days long. Since the Earth in turn revolves around the Sun, the Moon also participates in this motion, called "translation," describing a kind of spiral path along the Earth's orbit. The various positions that the Moon assumes with respect to the Earth and Sun during its revolution make it appear differently illuminated in the course of the lunar month. When it is between the Earth and Sun (conjunction) it appears completely dark, and we have a "new moon" (point at which the lunar month begins). Almost 15 days later, however, it is located on the opposite side of the Earth from the Sun (opposition) and its face is therefore fully illuminated (full moon). Hence the succession of waxing and waning phases of the visible portions of the Moon. At the first or third quarters of the lunar month (half-moon), exactly half the disk appears illuminated, with the convex portion facing west or east depending on the quarter. The Moon is responsible for eclipses: in the course of its complex revolutions and translations, it can find itself aligned in the same plane with the Earth and the Sun. If it comes between the two, it blocks the view of the Sun from some parts of the Earth (solar eclipse); if it is in opposition, however, the Earth's shadow will cover the Moon (lunar eclipse). The rarity of eclipses is due to the fact that the orbits of the Earth and Moon are not in the same plane (otherwise there would be an eclipse of the Sun at every new moon, and a lunar eclipse at every full moon), but instead constitute two planes which intersect to some degree. The mutual gravitational force between the Earth and Moon is also responsible for the tides.



But how and when was the Earth formed, and how did it develop? Raymond Siever provides some answers:

> *These are the questions that link the testimony of a fragment of rock about the history of the Earth and the other planets to deductions drawn from astronomy about the formation of the stars and the evolution of the solar system.*
>
> *The theories which state that the solar system formed from a cloud of gas and dust are still being refined, but they all share the fundamental idea that about 4.6 billion years ago, the Earth grew to approximately its present size because of a combination of two processes: condensation of the primordial material of the solar cloud, and aggregation of minute fragments of other planetary material that was in the vicinity. The ancient history of the Earth was characterized by uninterrupted accretion and a rapid increase in temperature due to a combination of three effects: heating caused by the radioactive elements that were abundant in the initial condensation product; heating due to the impact of material which then sank; and heating produced by contraction of the newborn planet. According to what has now become the conventional viewpoint, this increase in temperature led to widespread melting and massive differentiation of the Earth, into a core, a mantle, and a crust. All these theories, postulated long before the solar system was explored by spacecraft, have recently been refined by studies of the Moon and the other planets. This is particularly true for the Moon, where astronauts have collected samples from an object whose development halted at an early stage. With no atmosphere and no oceans, the Moon had no atmospheric agents to produce chemical alterations that might destroy generations of rocks from previous epochs. In addition, it did not offer an environment favorable to the development of life. A close examination of the Moon reveals how important the Earth's fluid coating of water and gas has been. Moreover,*

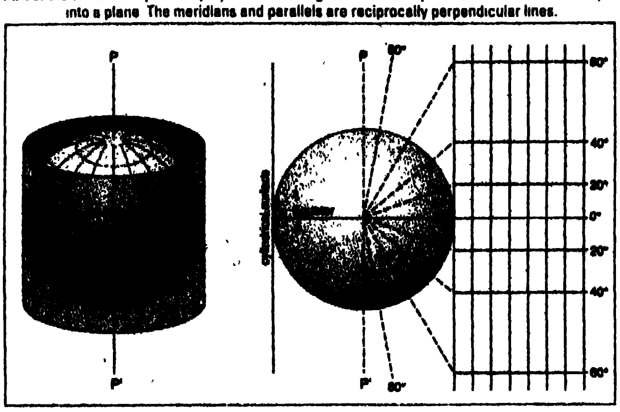

The Solar System
Nebula of gas and cosmic dust
Concentration and production of heat
The sun, a veritable nuclear furnace, starts its life. The planets begin to form


The Movements of the Earth
Earth's axis

Map Projections

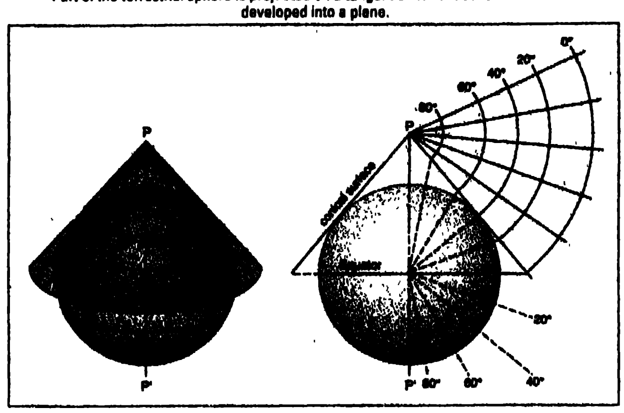
Cylindrical

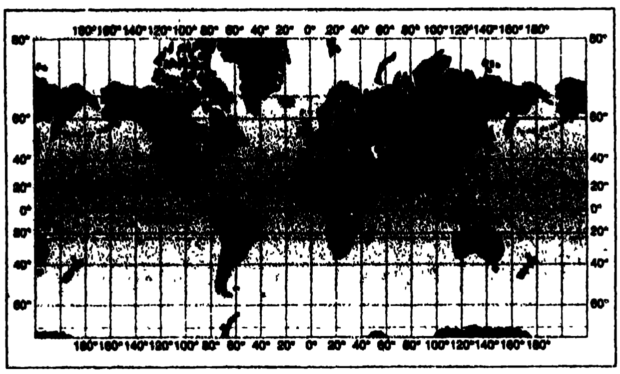
Part of the terrestrial sphere is projected on a tangent or secant cylinder which is then developed into a plane. The meridians and parallels are reciprocally perpendicular lines.



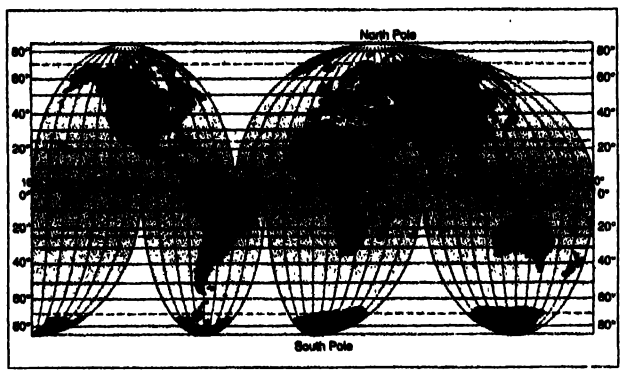
Conic

Part of the terrestrial sphere is projected on a tangent or secant cone which is then developed into a plane.



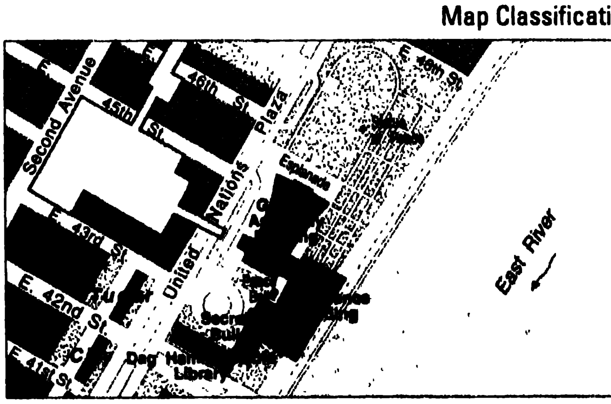


Mercator cylindrical projection

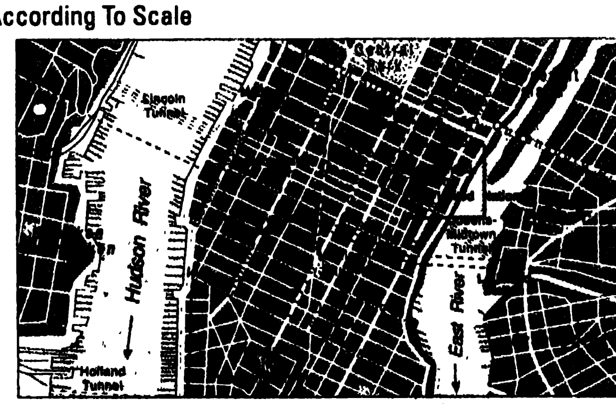


Goode's modified conic projection

Map Classification According To Scale

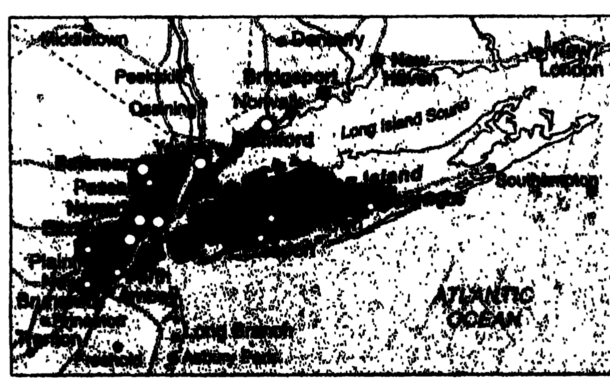


Plan (scale 1:10,000)



Topographic map (scale 1:100,000)

Chorographic map (scale 1:500,000)



Geographic map (scale 1:5,000,000)

the composition of that gas was not the same as that of our present atmosphere. In its earliest phases, the primitive atmosphere was devoid of oxygen and contained reducing gases such as methane and ammonia.

Shape and dimensions of the Earth. The spherical shape of the Earth was postulated by the philosophical school of Pythagoras in the 6th century B.C., and Greek cosmographers also made the first attempts to measure the circumference of the Earth using scientific methods.

Its shape is not actually a perfect sphere, but in fact is more similar to an ellipsoid of rotation—a solid produced by rotating an ellipse about one of its two axes (the minor axis in this case)—hence the description of the Earth as a sphere that is "slightly squashed" (oblate) at the poles. But modern geodetic methods, assisted by artificial satellites, have detected other irregularities, albeit tiny ones, that have led to the Earth's shape being described as "geoid" ("Earth-like"). A small sphere or globe on which the outlines of the continents are drawn is nevertheless the most faithful representation possible of our planet.

The almost spherical shape of the Earth gives rise to many facts and phenomena that only modern science has been able to explain fully. For the ancients—who even after Pythagoras' demonstration and down to the end of the European Middle Ages favored a disk shape, on which the landmasses were surrounded by a single ring-shaped ocean—the spherical theory presented the problem of the Antipodes: why did their inhabitants not fall off into space? It was a substantial problem until Newton explained it scientifically by way of gravity.

Although it required advanced concepts of geometry and mathematics, developed specifically by the Pythagoreans, an explanation of the various ways in which the Earth was illuminated by the Sun's rays seemed simpler. In this context, it mattered little that the Earth was believed to be the center of the solar system: the effects were the same. And as mentioned, they were effects of great importance, explaining the alternation of day and night, the seasons, and climatic zones. Even the Greek word *klima*, "inclination," took into account two concomitant facts: the inclination of the spherical surface from the equator to the poles, and the changes in the angle between the horizon and the Sun at the meridian at different times of the year.

To these geometric concepts of equator, poles, and meridian, the Pythagoreans added the astronomical ideas of tropics and polar circles, although they dismissed the possibility of human life in the torrid equatorial zones and the frozen polar caps. The reason it took two millennia for these theoretical concepts to be confirmed in practice and by the experimental sciences was simply that the technological resources of the time were no match for the sophistication of Greek theoretical speculation, and because the circum-Mediterranean world, where these theories had been developed, was isolated and had only very few sporadic contacts with other regions which were home to different but equally advanced civilizations, such as China or the completely unknown cultures of pre-Columbian America.

But a crude sort of technology was used in support of the first serious attempt at experimental proof of these theories, as in the case of the measurement of the Earth's curvature undertaken by Eratosthenes of Cyrene in the 3rd century B.C. He selected a tropical location (modern Aswan) where at noon on the day of the summer solstice the Sun shone down to the bottom of even the deepest wells (and was therefore at the zenith). Measurements of the inclinations of the Sun's rays at a more northerly location (Alexandria), which was believed to lie on the same meridian, made it possible to calculate the angle of that inclination projected to the center of the Earth. At that point all that was necessary was to measure the linear distance between the two places to determine the meridian arc and therefore the Earth's circumference.

There is disagreement as to the accuracy of Eratosthenes' answer, but it is a fact that Ptolemy's geography, transmitted through the dark centuries of the Middle Ages, reported estimates so much lower than reality as to justify the splendid error of Columbus, who was convinced he could reach Japan by crossing the Atlantic. Even after the discovery of the Americas, another century of adventurous navigation across the oceans was needed to give an approximate estimate of the world's real dimensions and associate them, on those wonderful Renaissance planispheres, with an equally approximate and incomplete depiction of the outlines of the continents.

But the European powers were concerned less with dimensions than with the resources of the lands that were being discovered, while the common people were curious about the new and unexpected peoples, animals, and places, and shared the adventurous spirit of the explorers.

The need to quantify the size of the new colonial empires and to draw their borders required systematic surveying of the entire planet. The world seemed extremely large, almost endless, by comparison with the tiny size of the populations that lived on it and their ability to possess it. However, it was this knowledge which began the process that in three centuries would lead to the present "global village," dominated by the most advanced technologies and wracked by the problems of development.

The "geographical network" and the measurement of time. The Earth thus turned out to be much larger than the ancient cosmographers and the geographers of the age of exploration had thought: an entire New World, the Americas, was revealed to the first navigators (Vespucci and Verrazzano among them) who followed the routes opened up by Columbus. There was no sign, however, of the southern continent about which tales had been spun since the ancient Greeks. Australia was believed to be part of that mythical landmass, which was supposed to extend to polar latitudes; but in reality it was found to be a continent unto itself, albeit the smallest. Another great discovery was the immense Pacific Ocean, and the realization that about two thirds of all the world's surface was covered with water.

In France, only two hundred years ago, the first scientifically correct measurement of the Earth's circumference was performed, and the decimal-based metric system was applied to measurements of distance; the unit adopted was no longer an anthropomorphic characteristic (foot, span), but the meter, which is a fraction (one forty-millionth) of the Earth's circumference. At almost the same time, another great problem was solved: that of determining longitude. It was addressed with the use of a chronograph and used as its reference point a single meridian, known as the prime meridian, specifically the one which passes through the astronomical observatory at Greenwich, near London. It is interesting to note here that the division of a circle into 360 degrees goes back to the ancient Babylonian

civilization and was adopted by the Greeks, in particular by the school of Pythagoras, to whom we also owe the definition of angular values of longitude and latitude, both based on the same 360-degree division of a circle. But while longitudes refer to the prime meridian and its antimeridian (see below), and were reckoned from 0° to 180° east and west of the prime meridian, latitudes are calculated with reference to the equator (0°) and the poles (90° north and south of the equator).

Humans have always based the measurement of time on the apparent passage of the Sun, but only the universal adoption of a prime meridian (a word deriving from the Latin *meridies*, "noon") made it possible to standardize the number of hours in a day; the figure was fixed at 24, thus dividing the Earth into 24 time zones bounded by meridians 15 degrees apart ($24 \times 15 = 360$) and always referred to the Greenwich meridian. Opposite this, in the middle of the Pacific Ocean, lies the 180° antimeridian, which constitutes the International Date Line for ships and aircraft that pass over it (crossing eastward, the traveler "loses" a day; crossing westward, a day is added). As far as the length of the year is concerned, as early as the 16th century it had been observed that dividing the solar year into 365 days resulted in approximately 6 hours being left over, so a day was added every 4 years (leap years). The months, on the other hand, continued to be based on the phases of the Moon, although in very imperfect fashion, since there are slightly more than 12 lunar cycles (each lasting 29 and a half days) in each year.

Mapping the Earth. The grid of meridians and parallels ("geographical network") already sketched out by the Pythagorean mathematicians thus acquired universal validity, while the new resources of geodetic science were gradually refined to ensure that every point on Earth could be specified exactly with reference to that network. This made it possible to produce a perfect model of the Earth, and with the development of surveying instruments, marked the birth of modern cartography.

The problems of effectively depicting a spherical surface on a plane had also already been addressed in the Classical period and passed on to the modern age. Many of the projections still used today are those developed in the Renaissance by geographers such as Coronelli, Blavio, and Mercator. The map-makers' task was enormous, considering the speed with which knowledge about the newly discovered lands was being gathered. Before the establishment of modern geodesy, however, even the more advanced countries used highly inaccurate cartographic methods. It was not until the 18th century that cartographers could take on the task of surveying, accurately and with mathematical precision, every object that could be depicted at various scales on a map, and developing conventional signs and symbols capable of representing them.

Within a suitably dense geographic network, the greatest possible number of reference points are identified by means of optical measurements with geodetic bases (line segments) established on the ground to an accuracy of millimeters. These produce trigonometric grids (triangulation) that can be extended over enormous areas and also be applied to determinations of elevation. The definition of a sufficient number of surveyed points in turn makes it possible to draw the "hypsometric lines" (also known as contour lines) that, although abstract, are the most efficient and intelligible way of representing relief, replacing the first crudely sketched "molehills." The advent of photography and later the ability to take photographs from aircraft produced a sharp increase in cartography, even for countries and regions that were recently discovered or had remained at the margins of modern development.

Today cartographers use surveys made from artificial satellites designed for that specific purpose, such as Geosat, which can also be used to monitor other phenomena such as terrestrial magnetism, vegetation, and various kinds of pollution. Also in orbit are meteorological satellites (Meteosat, etc.), whose images we see every day on television screens and which, with their continuous imaging, global coverage, and the application of digital technology, now permit short- and medium-term forecasting and have helped increase climatological knowledge.

Maps and atlases. Today geographical maps are a part of everyday life. One reason is that maps—those reduced, symbolic, and approximate depictions of the Earth's surface or portions of it—are so versatile in terms of scale, content, and expressive ability that they can reproduce an almost inexhaustible range of facts and phenomena: not just those relating to geography and topography, but also human concerns such as economics, culture, and society.

The first distinction to be made in giving a correct classification of maps involves their scale, or the relationship between actual distances and those depicted on the map. This relationship is expressed numerically as a ratio, in which the figure to the left of the colon is the unit of measurement and the figure to the right indicates how many times the unit of measurement on the map (an inch, for example) must be multiplied to yield the corresponding actual distance. Thus a scale of 1:10,000 means that one inch (or centimeter) measured on the map is equivalent to 10,000 inches (or centimeters) on the Earth's surface. The larger the figure to the right, the smaller the scale. By convention, large-scale maps (between 1:10,000 and 1:100,000) are called topographic maps; medium-scale ones (between 1:100,000 and 1:1,000,000) are called chorographic; and small-scale maps (greater than 1:1,000,000) are called geographic.

A topographic map would be useful for a walk in the country, a chorographic one for a highway trip, a geographic one for a long airplane journey (after which one would go back to chorographic and topographic maps when visiting smaller regions). It is a little like using different lenses to photograph objects of different sizes.

The language of maps is analogical and symbolic: a river will always be drawn as a more or less tortuous line (although on topographic maps the two banks may also be drawn with separate lines), but a city may be depicted with a sketchy outline of streets and building only on large-scale maps, while on smaller-scale maps the cartographer resorts to symbolic dots or circles of varying sizes depending on the importance of the city. The symbols on a map can be point-like (indicating an individual locality, a mountain peak, for example), linear (depicting the course of a river, the outline of a coast, or contour lines), or two-dimensional (representing the surface of a lake, a forest, a political unit, etc.)

Every map of this type should show the geographic network, or at least should indicate latitude and longitude at the edges;

maps are also almost always oriented with north at the top, and if not, should include an arrow indicating geographic north. Like all languages, cartographic language obviously has its own grammar and syntax. But it requires the assistance of traditional text for certain kinds of specific information, principally place-names. Numbers also find a home on maps, indicating latitude and longitude, elevations and depths. Lastly, legends and titles are also important, helping to interpret symbols.

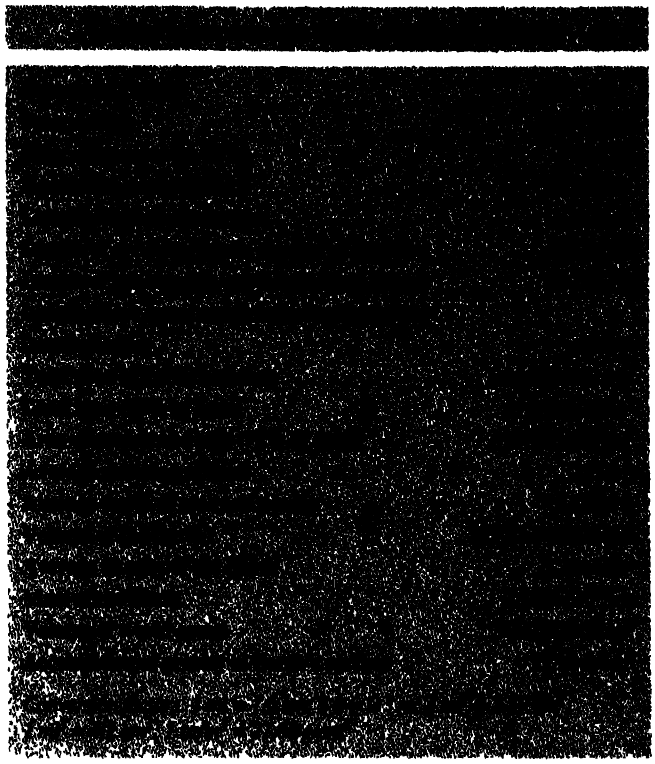
With the aid of text, cartographic language can express a number of subjects or topics aside from purely representing the Earth's surface, although they may have a certain relevance. For example, maps can represent statistical data, such as different levels of income or education or crime in various parts of a country. These are known as quantitative thematic maps, while qualitative thematic maps use different colors to describe geological characteristics, soil utilization polluted areas, and so on.

Like nautical charts, weather forecasting maps are essential for ship captains and also for aircraft pilots, just as road maps are valuable for anyone who travels for business or pleasure. Then there are atlases (systematic collections of maps of a specific region or of the entire Earth), which help students to learn geography but also serve as updates for anyone who wishes to stay informed about events occurring anywhere in the world. And alongside the usual geographical atlases there are thematic atlases of countries or regions, which contain all kinds of information about them, from physical characteristics to demography, from social to economic phenomena, including comparisons with past situations or projections of possible future events (diachronic maps).

The smaller the world looks, the greater the need to understand it in all its aspects, in order to manage its resources better, to protect the quality of its environment, to reduce inequalities among its peoples—in a word, to learn to manage as best we can the planet on which we happen to live.

The Earth. The Earth's volume is almost 240 billion mi^3 [1 trillion km^3]; its average radius is 3950 mi [6371.23 km], while its circumference is almost 25,000 mi [40,000 km]. As we have already mentioned, however, the Earth is not actually a perfect sphere, even though the numerous irregularities which characterize its surface, both above and below the oceans, are practically negligible by comparison with its size: the maximum deviation, between the depth of the Vitjaz trench (−36,152 ft [−11,022 m]) and the top of Mt. Everest (29,100 ft [8872 m]), corresponds to 0.31% of the mean radius of the Earth. In other words, the Vitjaz trench would constitute a scratch only 1/25 of an inch deep on a sphere more than a yard in diameter! In addition, the Earth is slightly flattened at the poles and a bit wider at the equator as a consequence of its rotation about its own axis. The polar radius is therefore shorter than the average (3941 mi [6356.78 km]), while the equatorial radius is a little longer (3954 mi [6378.16 km]). Comparing the two, we get a ratio of 1:298, which indicates the Earth's "oblateness." The difference between these two radii is enough that it cannot be neglected in the preparation of geographic maps.

Oceans and dry land. The liquid blanket that covers the Earth, the "hydrosphere," possesses numerous discontinuities corresponding to large exposed areas of the Earth's crust. The Earth's surface as a whole (196.9 million mi^2 [510.1 million km^2]) is mostly covered by seas and oceans (71%, or 139.8 million mi^2 [362.15 million km^2]), while dry land, represented by continents and islands, constitutes only 29% (57.1 million mi^2 [147.92 million km^2]). These land areas are completely surrounded by water, while all the oceans are continuous with one another. If we then take the average elevation of the land area above the surface of the hydrosphere, it turns out to be about 2750 ft [840 m], while the average depth of the hydrosphere is 12,500 ft [3800 m]. Considering that the total volume of the oceans is about 329 million mi^3 [1.37 billion km^3], if the Earth's surface were completely level it would therefore be covered by a continuous layer of liquid more than 8200 ft [2500 m] deep.



According to current historical and geographic standards, the Earth's landmasses are divided into four major continental areas: the Old World, comprising Africa, Asia, and Europe; the New World, comprising North and South America; the Newest Continent, represented by Australia; and lastly Antarctica. As we shall see later on, this division deviates from the actual geological structure which characterizes the Earth's crust, whose continental masses have a very different meaning.

Another noteworthy fact is that more than two thirds of the planet's land area lies north of the equator, while oceans predominate south of that line. The oceans in turn are traditionally divided into three major groupings: the Atlantic Ocean, with an approximate area of more than 60 million mi^2 [100 million km^2], extending from the Arctic (a name referring to the northern polar regions) to the Antarctic between the Americas, Europe, and Africa; the Indian Ocean, 47 million mi^2 [75 million km^2] in size and bounded by Africa, Asia, Australia, and Antarctica; and the Pacific, lying between the Americas, Asia, Australia, and Antarctica and constituting the largest area of ocean on Earth (approximately

112 million mi^2 [180 million km^2]).

Elevation. Leaving aside those areas covered by the oceans, the solid surface of the Earth is articulated in various ways, especially in terms of elevation. A fairly accurate idea of that articulation and of the elevational profile of the continents and the ocean depths is provided by a statistical graphic representation, such as the "hypsographic curve" of the Earth's surface, which shows the total areas of both dry and submerged land lying at various elevations or depths. An examination of this curve reveals the presence of two plateaus separated by an abrupt discontinuity: the first corresponds to the "continental shelf" which often lies at depths of approximately 650 ft [200 m], and the second constitutes the ocean floor itself, partially dissected by deep trenches, with scattered relief of various kinds (often isolated volcanic structures) and long lines of ridges. The step between is referred to as the "continental slope," and often represents a single drop in level of 6000–10,000 ft [2000–3000 m].

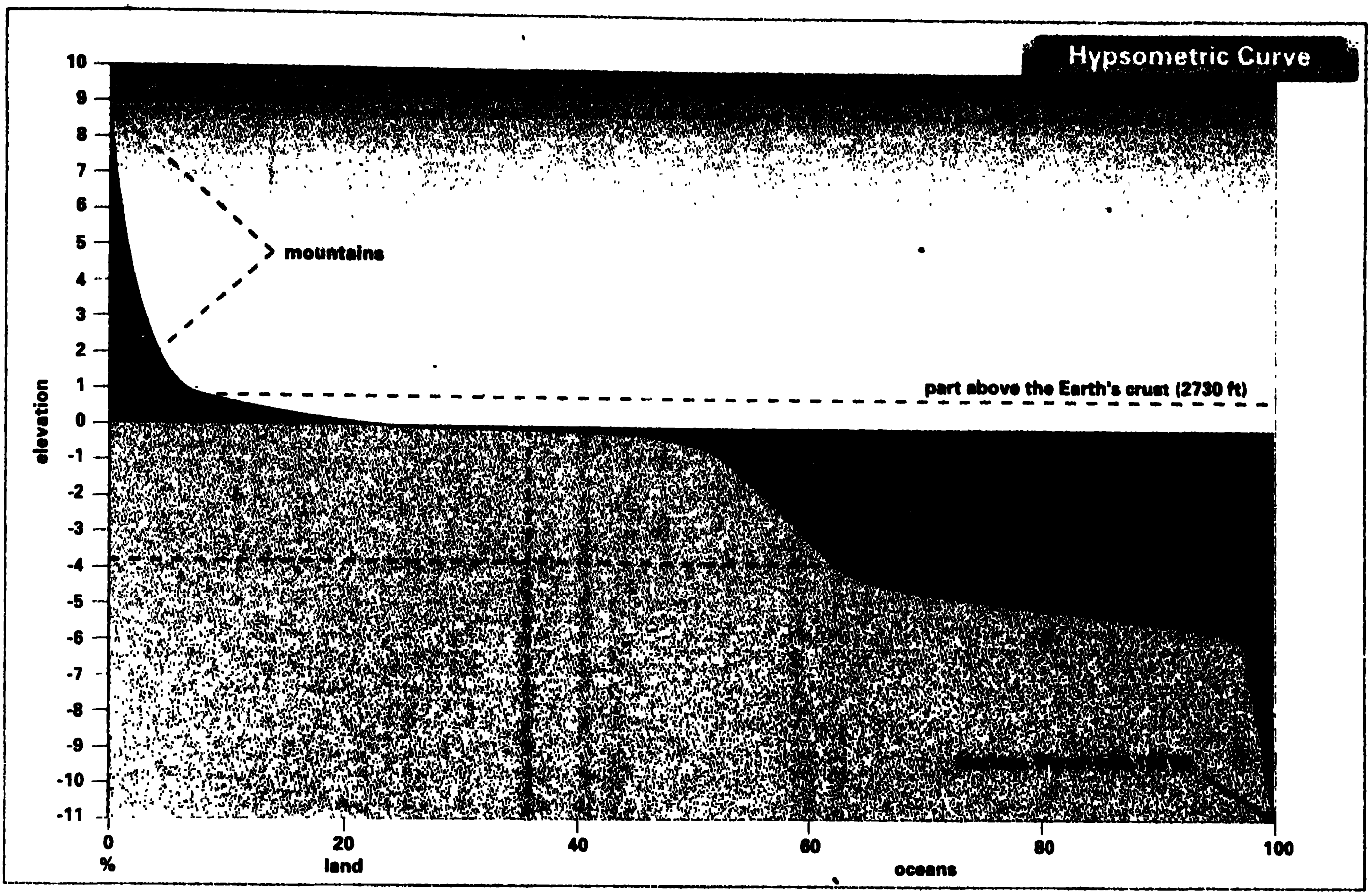
The topographical articulation of horizontal, convex, and concave shapes which characterize the surface of the Earth above the oceans constitutes its relief. It is more vigorous, the greater the difference in elevation between two nearby points; characteristic traits of relief include slope (gentle or abrupt) and shape, which is sometimes monotonous and sometimes highly articulated, and in general depends on the structure and the type of rock onto which the relief is modeled.

Horizontal forms are characteristic, obviously, of plains, which from an elevational point of view can be divided into "low" and "high" plains; these two may have very different origins, one alluvial, and the other erosional or structural. Concave and convex forms are occasionally found in isolation (such as isolated volcanic cones or river valleys that interrupt the continuity of a plain), but are more commonly associated with one another in various kinds of alternation. Convex relief types, such as mountains, hills, and massifs, are numerous and extremely varied in their form and structure. In general they are grouped together and often aligned to form "ranges" or "systems" of ranges (such as the Alps, Andes, Appalachians, etc.). The typical concave form is the "valley," which normally represents the element separating two mountains and generally has a watercourse passing through it. Other typical concave forms are "depressions," low-lying areas surrounded by higher relief. When they lie below sea level, they are called "absolute depressions"; a typical example is the Dead Sea, which lies almost 1000 ft [300 m] below sea level. Other typical concave forms are "basins," often located at the confluence of several valleys; they too are true depressions surrounded by mountains. Among the convex forms, the distinction between "mountains" and "hills" is generally a matter of elevation, the latter usually being less than a thousand feet high. In strictly morphological terms, a mountain has a summit, which can bear various names. A valley has a "valley bottom," sometimes narrow and cut into by "gorges" or "ravines," sometimes wide and flat. Lastly, mountains and valleys have one element in common: the "slope" or "flank" of variable inclination, which constitutes the connection between the valley bottom and the peak line or "crest."

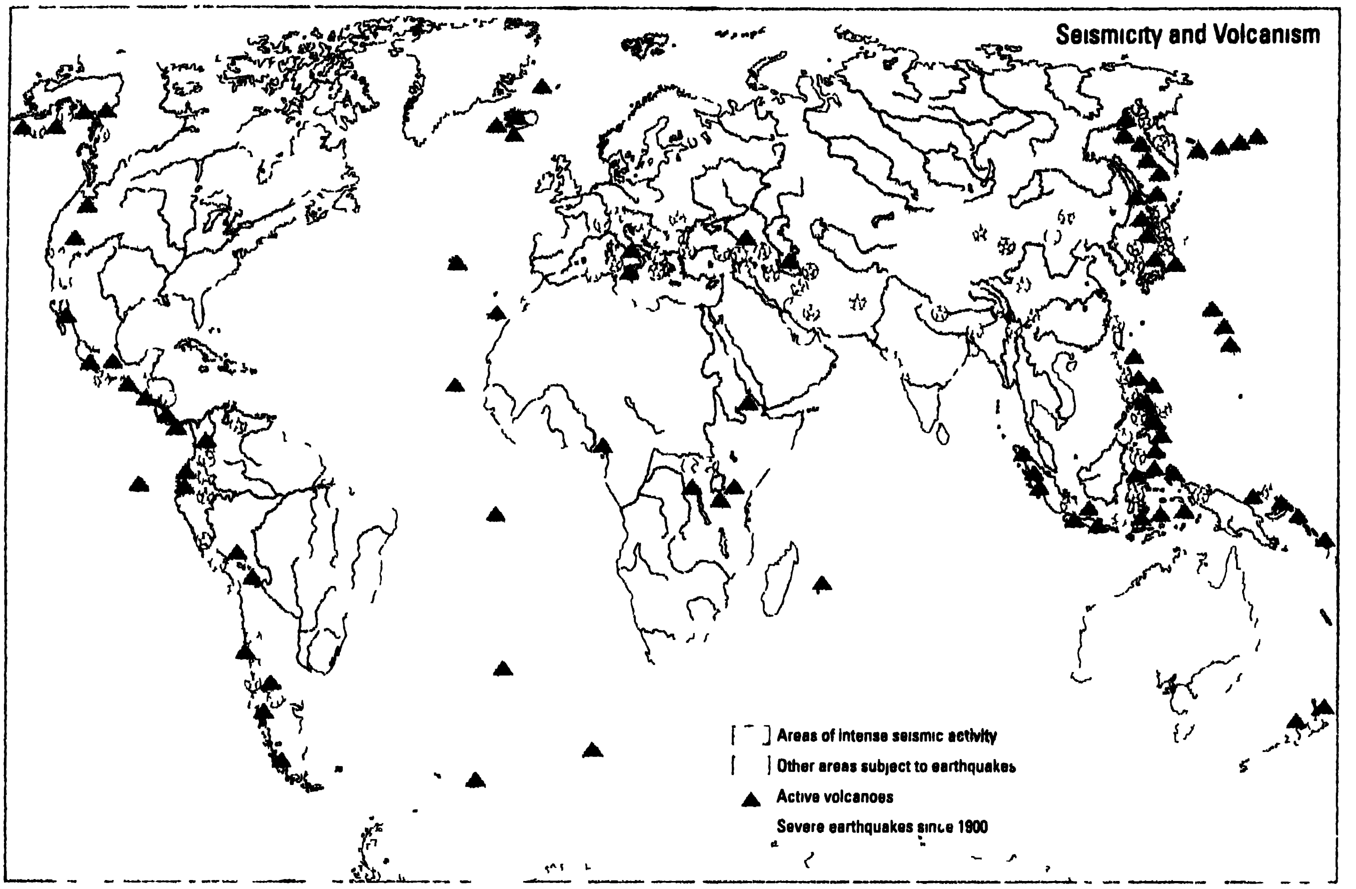
The lithosphere. ***Internal structure of the Earth.*** Although humans have walked on the Earth's surface for many millennia, their direct knowledge of the planet's interior is somewhat limited, as compared with its outer integuments such as the atmosphere. This is understandable given the nearly impervious nature of the lithosphere, the outermost solid covering of the globe. It is true that natural caves do exist, and can be more than 300 ft [100 m] deep, while mines have been dug down to more than 6000 ft [2000 m] and oil wells have exceeded 26,000 ft [8000 m]. At such depths, however, the technological difficulty of advancing a drill bit is truly immense, given that within the Earth's crust (at least in its upper reaches), the temperature of the rock rises by an average of 1°F every 60 ft [3°C per 100 m]. This factor is known as the "geothermal gradient."

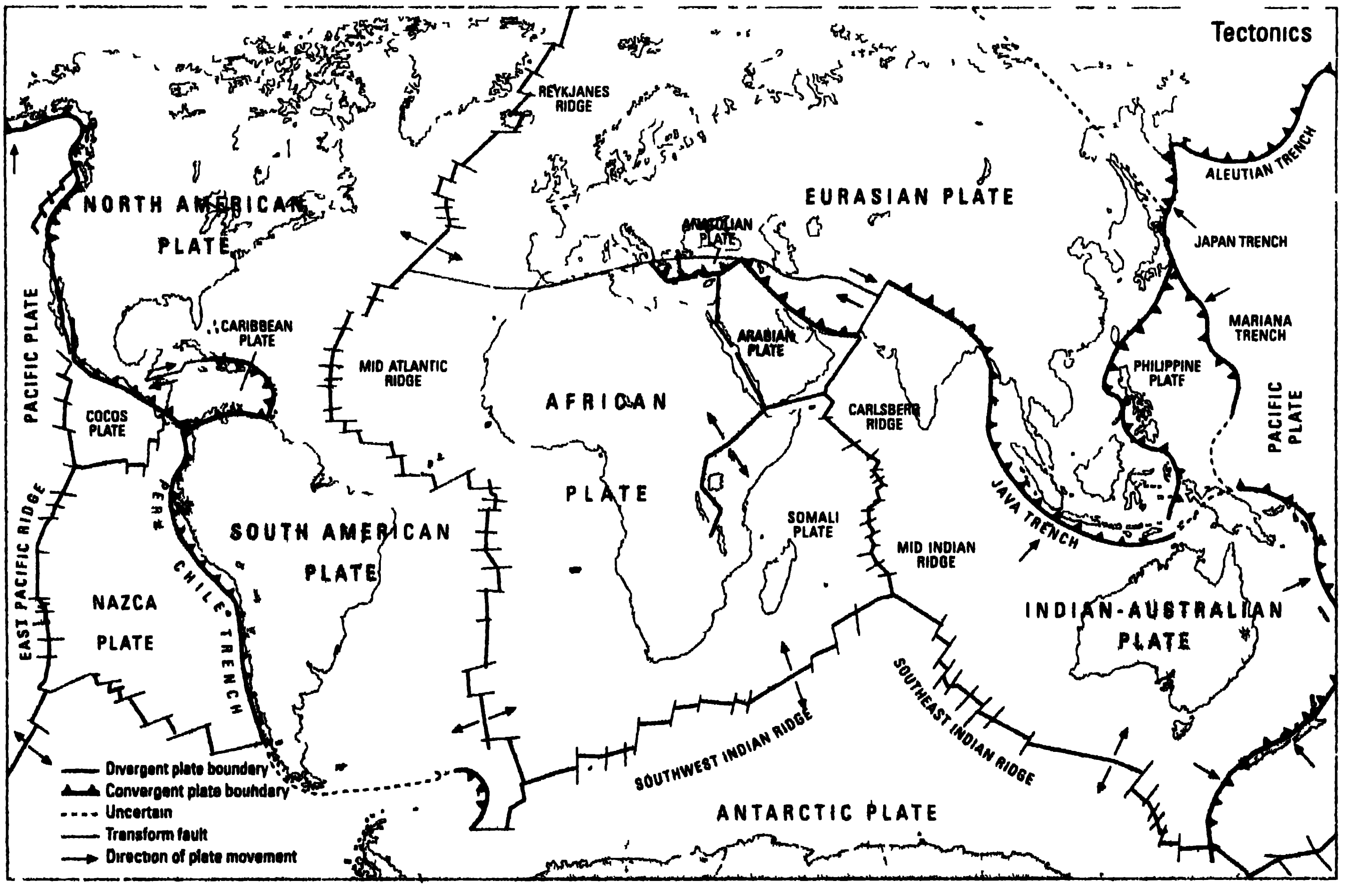
Better and more accurate information about the internal structure of our planet has been gained by analyzing the behavior of seismic waves: these are transmitted through the solid portion of the Earth when earthquakes occur (see below), and their velocity varies depending on the physical characteristics of the medium they are passing through. On this basis, reasonable hypotheses can be made about the density and nature of rocks at great depths. Since the specific gravity of the rocks nearest the surface is 2.8 g/cm^3, and the average for the Earth as a whole is 5.5 g/cm^3 (as calculated from measurements of the Earth's mass), it has been theorized for many years that the innermost part of the planet must have a specific gravity greater than 10, and therefore must consist of heavy materials (iron and nickel compounds). These suppositions supported a hypothesis that the internal structure of the Earth consisted of a series of layers whose density increases from outside to inside. They are assumed to comprise a heavy "core," around that a "mantle" of lower density believed to contain oxide and sulfide minerals, and then on the outside the Earth's actual "crust," with an even lower density (2.8) and a thickness of a few dozen miles. The crust in turn was assumed to be formed of two distinct layers: the lower is called the "sima" (containing predominantly rocks composed of silicon and magnesium, such as basalt), and above it the "sial" (with rocks containing silicon and aluminum compounds).

The most recent models which attempt to explain the internal structure of the Earth do not differ greatly from the one just presented: they retain the sequence of layers (crust, mantle, core), but provide more extensive and more detailed information about each one. The separations between the various layers are revealed by "discontinuities" in the propagation of seismic waves, which are referred to by the names of their discoverers. The crust, for example, with an average thickness of 22 mi [35 km], is separated from the mantle by the Mohorovičić discontinuity (or Moho), while the Gutenberg discontinuity, at a depth of 1800 mi [2900 km], divides the mantle from the core. Minor discontinuities seem to indicate that the core itself consists of an outer, fluid part and an inner solid nucleus. The mantle is also believed to be essentially solid, with the exception of its upper layer, which lies at depths of between 60 and 150 mi [100–250 km] and is thought to be fluid (the "asthenosphere"). The crust and the outer part of the mantle, however, down to 60 mi [100 km], are solid, even though they contain large regions in which the rocks are in a fluid state because of the very high temperatures (2700–3600°F [1500–2000°C]): this layer constitutes the "lithosphere," the


Hypsometric Curve
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
elevation
mountains
part above the Earth's crust (2730 ft)
0
20
40
60
80
100
%
land
oceans


The Earth
Earth's
axis
polar radius
3963 mi
North Pole


Seismicity and Volcanism
Areas of intense seismic activity
Other areas subject to earthquakes
Active volcanoes
Severe earthquakes since 1900


Tectonics
REYKJANES RIDGE
NORTH AMERICAN PLATE
EURASIAN PLATE
ANATOLIAN PLATE
ALEUTIAN TRENCH
JAPAN TRENCH
MARIANA TRENCH
PACIFIC PLATE
CARIBBEAN PLATE
MID ATLANTIC RIDGE
ARABIAN PLATE
PHILIPPINE PLATE
COCOS PLATE
AFRICAN PLATE
CARLSBERG RIDGE
PACIFIC PLATE
EAST PACIFIC RIDGE
PERU CHILE TRENCH
SOUTH AMERICAN PLATE
SOMALI PLATE
MID INDIAN RIDGE
JAVA TRENCH
NAZCA PLATE
INDIAN-AUSTRALIAN PLATE
SOUTHWEST INDIAN RIDGE
SOUTHEAST INDIAN RIDGE
ANTARCTIC PLATE
Divergent plate boundary
Convergent plate boundary
Uncertain
Transform fault
Direction of plate movement

solid covering which contains all the rocks that crop out at the Earth's surface and is the site of most seismic and volcanic phenomena.

Seismic phenomena. Within the lithosphere, movements of large bodies of rock can cause specific stress phenomena that can release enormous quantities of energy when they are resolved. This energy is transmitted in the form of mechanical vibrations, in other words seismic waves, which radiate out in every direction and also reach the Earth's surface. There they produce occasionally violent shaking of the ground, and are capable of changing the landscape and destroying or at least damaging structures built by humans.

The point in the lithosphere at which the energy release occurs is called the "hypocenter." The first waves to arrive from it (at a velocity of 3 mi/sec [5 km/sec]) are longitudinal or compression waves, followed shortly thereafter by transverse or shear waves (which are slower, traveling only 2 mi/sec [3 km/sec]). When they arrive at the "epicenter" (the point on the Earth's surface located vertically above the hypocenter), seismic waves produce vertical oscillations or shocks. At increasing distance from the epicenter, the oscillations tend to become horizontal (undulatory shocks); there are also cases of rotary shocks caused by combinations of horizontal oscillations. Until quite recently, earthquake intensity was assessed empirically, on the basis of the destruction of human structures that was caused (Mercalli scale, named after the Italian volcanologist and seismologist who introduced it in 1902); today, however, it is possible to measure directly the energy unleashed by seismic events, by analyzing seismograms that record the oscillation of a recording pen exposed to the shock received during the earthquake. From this can be calculated the "magnitude," the value of which is indicated on the Richter scale, named after the American seismologist who proposed it in 1935.

The geographical distribution of earthquakes essentially coincides with the location of the great fractures that exist within the Earth's crust, the major recently formed mountain systems (Alps, Andes, Himalayas, etc.), and regions affected by active volcanism. All of Italy, for example, is highly seismic, due to the presence of the geologically young Apennine mountains, Sicily, and part of the Alpine system.

Volcanism. According to the accepted definition, volcanic phenomena involve the emergence at the Earth's surface of fluid and gaseous materials deriving from inside the crust, in particular from regions in which rocks are in the fluid state, that is, have been melted by extremely high temperatures. Under such conditions they constitute "magma," a fluid substance at high temperature and with a certain degree of viscosity; its chemical composition is quite variable, and it also contains gaseous substances which help elevate its own pressure. When this pressure exceeds the strength of the overlying rock separating the magma (contained in a "magma chamber," generally fed from the large reservoir of the asthenosphere) from the Earth's surface, the material emerges, often in extremely violent fashion. As it does so, it also carries along solid materials, which accumulate together with other debris and produce the characteristic conical mountains that represent volcanic structures.

Inside each volcano is a "chimney" conveying the material that will be erupted out, and a "crater," the structure which connects the chimney to the outside world. The gases in the emerging material disperse into the atmosphere, while the magma, depending on its fluidity and therefore its viscosity, flows at various rates down the sides of the cone, forming characteristic flows of lava (the term applied to magma once it has emerged) which very quickly cool and solidify. Shreds and droplets of magma are also hurled into the air along with the gases; these cool rapidly and fall back to Earth, some as lapilli, volcanic bombs, and scoria, others as an extremely fine dust (volcanic ash), which can accumulate to considerable depths and are then termed pyroclastic deposits or volcanic tuff.

When the volcanic ash is extremely fine and is lifted to high altitudes during an eruption, it can often be swept along by winds and transported for great distances before falling back to Earth; in some cases it may even travel around the globe. This happened during the eruption of Krakatau (1883) in the Sunda Sea, and also during the more recent eruptions of Mt. St. Helens (1980) in Washington State in the U.S. and of Mt. Pinatubo (1991) in the Philippines.

The type of volcanic eruption just described represents a very elementary theoretical model; in reality, a volcanic eruption is a much more variable and complex phenomenon, the intensity of which also depends on the physical and chemical conditions of the lava, the quantity of gas and its pressure (which generally results in an explosive eruption), the depth of the magma chamber, etc. In many cases volcanic eruptions can also constitute a serious danger to humans, especially when they are accompanied by *nuées ardentes* ("glowing clouds"), agglomerations of suspended ash, debris, and gas at high temperature (1100–1500°F [600–800°C]) which can flow down the sides of the volcano at great speed, destroying everything in their path. It was the emergence of *nuées ardentes* from Mt. Vesuvius, when it awoke after eight centuries of silence, that destroyed Pompeii and Herculaneum in the year 79, and similar phenomena were produced more recently (1902) by Mt. Pelée and wiped out the city of Saint-Pierre on the Caribbean island of Martinique.

When an eruption has ended, a volcano enters a quiescent phase, which can last for long periods of time; during this quiescence it emits gases (containing sulfur and steam) and becomes a "solfatara," so named after the phenomenon seen near Pozzuoli in central Italy. Vesuvius itself is also experiencing a quiescent phase following its last eruption in 1944, and is sending out only aqueous vapors (fumaroles). One phenomenon directly related to volcanism is the "geyser," a violent and intermittent emission of water and steam; Old Faithful in Yellowstone Park is a geyser, and there are also many in Iceland (an entirely volcanic island).

Minerals and rocks. The Earth's crust consists of solid materials called "rocks." These in turn are made of up aggregates of "minerals," chemical substances of usually well-defined composition that are identified by their crystal habit. Minerals, and therefore rocks, result from the solidification of magmas present within the crust and the asthenosphere as they gradually cool. When this cooling proceeds very slowly, the entire molten mass has a chance to crystallize; when it occurs rapidly, crystallization remains incomplete and the resulting rock will be predominantly amorphous.

Igneous rocks, which are those that derive from the solidification of magma, can form either within the Earth's crust in a fairly slow process, in which case they are called "intrusive" or "plutonic"; or they can form outside on the Earth's surface during a volcanic eruption, and are then called "effusive" or "volcanic." Among the most familiar intrusive rocks made up entirely of crystals are granite, syenite, diorite, and gabbro; effusive rocks include porphyry, trachyte, and basalt. These in turn are classified as acid or basic depending on how much silica (SiO_2) they contain; the latter (such as basalt) derive from a highly fluid magma.

The first rocks that formed on Earth were undoubtedly of igneous origin; they constituted the primordial terrestrial crust and therefore the first relief that enlivened the planet's surface. The subsequent disintegration of these rocks by the usual erosive agents (especially flowing water) led to the formation and accumulation, at the bottom of the ocean basins, of huge thicknesses of detrital material deposited in layers. Compression and consolidation of these deposits then created new kinds of rocks, called "sedimentary," which eventually became exposed to the atmosphere when, in response to immense stresses within the crust, the ocean floors rose and emerged above the surface. Sedimentary rocks can in fact also form directly on the Earth's surface in the form of alluvial deposits produced by the activity of erosive agents (rivers, glaciers, wind, etc.). Often they also contain organic remains (of plants and animals), which over time experience profound changes and are converted into "fossils." When such fossils are present within sedimentary rocks, they can be used to reconstruct the environment in which they formed and to deduce the date of formation, supplying valuable information about conditions on the Earth's surface in the past.

Sedimentary rocks can be of clastic, chemical, or organic origin depending on their formation environment and mechanism. Clastic rocks derive from the accumulation of detrital material produced by erosion, and include numerous types that are classified on the basis of the dimensions of the individual rock fragments that constitute them and on their degree of cementation: conglomerates, sandstones, mudstones, marls, and sands are among them. Rocks of chemical origin, formed as a result of precipitation of substances that were dissolved in water, include several types of limestone as well as travertine, alabaster, and other types, along with salt deposits that formed by the evaporation of water in very hot environments (rock salt and gypsum, for example). Lastly, organic rocks are for the most part made up of the remains of organisms (shells, corals, and the like) that have generally accumulated at the bottom of ocean basins. The most important of these are the limestones and dolomites, but coal and lignite deposits can also be considered organic rocks. Liquid and gaseous hydrocarbons (petroleum and methane), which saturate porous rock layers, are also of organic origin.

Under specific conditions, both igneous and sedimentary rocks can be affected by severe pressures and high temperatures, and may even come into contact with magmas. As a result, they undergo physical, chemical, and mineralogical transformations which lead to the creation of completely different rocks, called "metamorphic." These rocks are identified by their predominantly schistose (banded or lamellar) appearance, and by being entirely crystalline. Metamorphic rocks include gneiss, mica schists, marble (produced by metamorphism of limestone), and serpentine (derived from basic effusive rocks).

According to Eugenio Turri:

> *Rock structures produce typical landscapes, since different rocky substrates are attacked in different ways by the external agents which shape the Earth's surface. The history of a landscape is therefore written in the history of rocks and of the Earth's crust....*
>
> *The nature of the rocks thus determines innumerable surface features that influence the world in which we live, although perhaps it does not define the psychology of humans who live there, as André Siegfried believed at the beginning of the century. He asserted that the Bretons, who live in an environment of ancient granite rocks, have a temperament different from peoples who live in landscapes with sedimentary rocks. This is like saying that the Italians of the limestone Alpine foothills are different from those of the craggy Apennines. The contrast exists, obviously, and results from well-known historical factors. But who can say what tortuous paths history has taken?*

Evolution of the Earth's crust. Since the 19th century there have been numerous theories attempting to explain the evolutionary mechanisms of the Earth's crust, in particular of the continental masses that rise above the oceans. At present, based on the fortunate intuition of the German geophysicist Alfred Wegener, who began in 1915 to advance his famous but much-disputed theory of "continental drift," most geologists believe that the upper portion of the Earth's crust consists of a mosaic of huge plates which float on the mantle, some higher up (the present-day continents) and others at a lower level (the ocean floors). These plates move at velocities of between 0.5 and 4 in. [1–10 cm] per year, and when they come into contact—if that contact occurs at a velocity exceeding 2.5 in. [6 cm] per year—one of the two plates tends to slide underneath the other (a phenomenon called subduction), forming an oceanic trench, while basaltic magmas rise up from the mantle and feed new volcanic structures. If two plates meet at a lower velocity, folding along the plate margins occurs, resulting in the formation of systems of mountain ranges which generally consist of cores of igneous or metamorphic rocks covered by sedimentary rocks. The oceanic plates, in particular, are formed and driven by magma rising from central fractures, which build up undersea ridges accompanied by massive volcanic structures that often rise above the ocean's surface. A typical example is the Mid-Atlantic Ridge, which emerges at several points as volcanic islands and archipelagoes (Iceland, the Azores, etc.). The ocean floors thus tend to become wider, causing their adjacent continental masses to move apart; such is the case with the Americas, which were once (about 135 million years ago) joined to Europe and Africa.

Orogeny and tectonics. The deformations experienced by the Earth's crust as a result of the huge forces generated within it (stresses between rock masses, convective magma movements, etc.) produce large areas of folding, generally along plate edges. These folding phenomena, responsible for mountain-building, or "orogeny," have characterized many chapters in the geological history of the Earth's crust. The most ancient

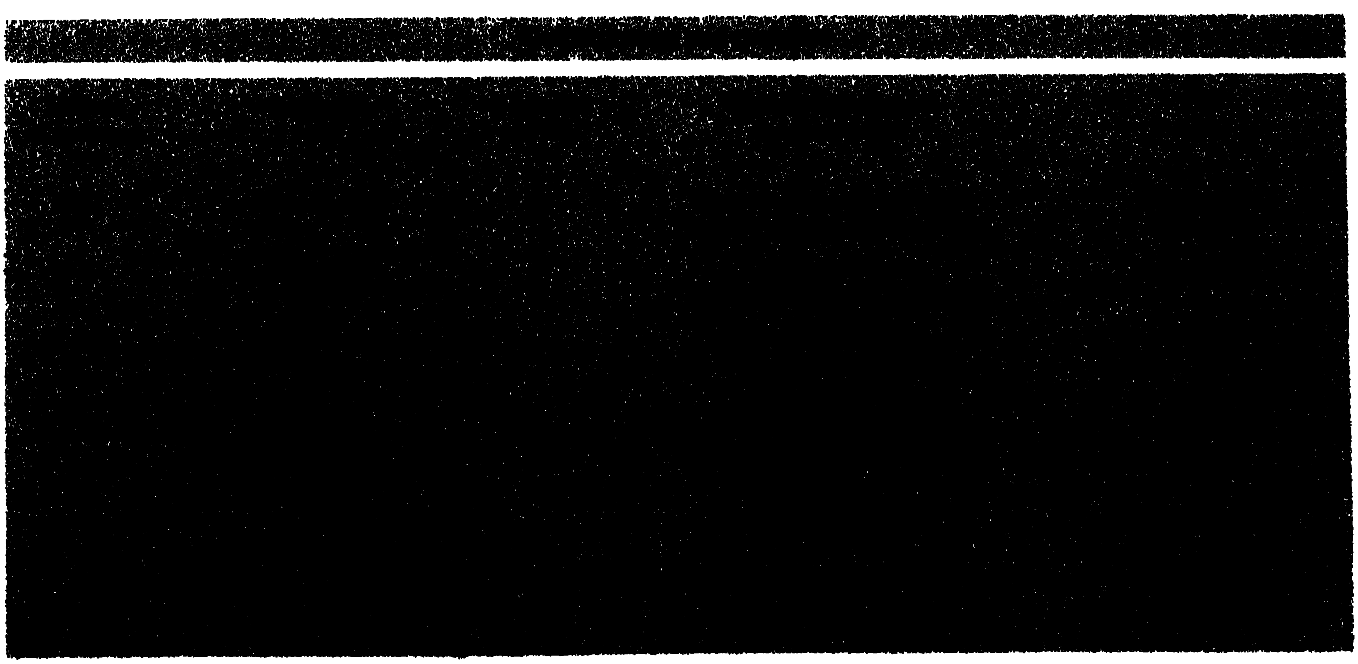
episodes, which occurred more than half a billion years ago, have left very few traces: the mountains that they raised up have been almost totally worn down by erosion. The great mountain systems that articulate the Earth's landmasses today are of relatively recent origin: the highest ones which still have extremely rugged morphology (like the Alps, the Himalayas, the Andes, and the Rocky Mountains) formed during the last 40–50 million years (and some are still rising and are therefore the site of intense seismic activity), while those that are lower and have softer shapes due to prolonged erosion (like the Appalachians, the Urals, and the shorter ranges of central Europe) formed about 250 million years ago at the end of the Paleozoic era (see below).

The study of the structural conditions which characterize the various rock masses that crop out at the Earth's surface, and the movements that have affected them, is of particular importance; this discipline constitutes "tectonics," or the complex architecture according to which individual rock masses, and the relief that has been shaped into them, are arranged on the planet's surface. Bodies of rock normally react to dynamic stresses according to their plasticity and their structure: sedimentary rocks, which are generally stratified, tend to fold or to break (if they are more rigid) along fracture planes that geologists call "faults," which also are present in igneous and metamorphic rocks.

Sometimes bodies of rock, regardless of their nature, can be fractured into multiple blocks, some of which end up at a lower level than others. The result is the formation of a "tectonic trench," such as those which appear in eastern Africa and are occupied by the great lakes (Victoria, Nyasa, etc.) and by the Red Sea. Folds and faults can also have extremely complex positions and structures (tilted, overturned, etc.), and especially during folding episodes, entire rock masses are forced by tectonic movements to slide over one another (overthrust phenomena, horizontal faults, etc.) resulting in an essentially dynamic metamorphism.

Geological history of the Earth. Without discussing in detail the way in which the Earth may have formed, suffice it to say that while Biblical accounts of its history indicate it was completed in only six days, today it is believed, on the basis of accurate scientific assessments, that the Earth's crust originated at least 4.6 billion years ago; the actual origin of the planet, undoubtedly linked to that of the solar system, must therefore be much more ancient.

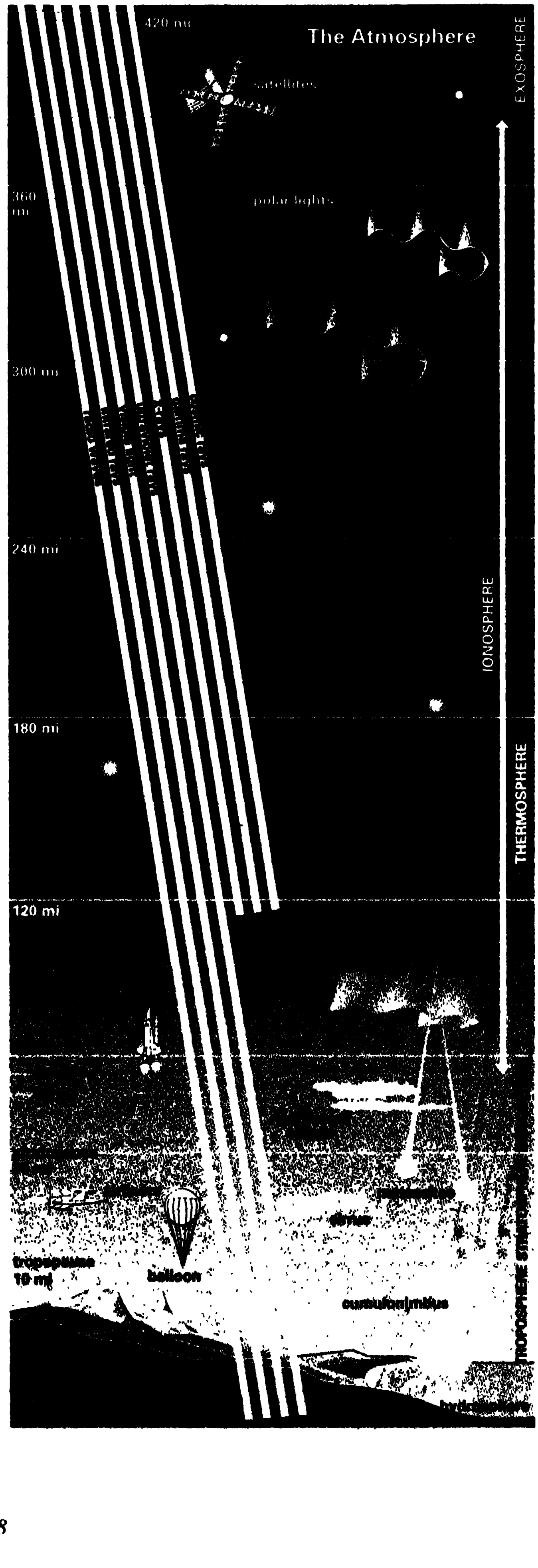
This information is provided by modern absolute dating methods that are based on an analysis of the changes experienced by certain chemical elements. For example, it is known that uranium, present in many igneous rocks, undergoes a radioactive decay process. The U^{238} isotope, in particular, by losing a certain number of particles from its nucleus, turns into Pb^{206} on a specific time scale. By determining the concentrations of uranium and lead present today in certain rocks, it is therefore possible to deduce the time at which they were formed. This method has been used to calculate that certain uranium-bearing rocks in South Africa were formed about 4.6 billion years ago, while the granite of Baveno near Lake Maggiore in northern Italy is only 280 million years old. These dating methods are complemented, however, by more traditional systems that can be used to determine the relative age of many rocks on the basis of the fossils that are present in them (whose evolutionary development is now known) and the rate at which certain sedimentary deposits accumulate. The evolutionary history of the Earth's crust has been divided into five major geological phases or "eras" of very different lengths, each comprising a certain number of "periods" which are further divided into specific intervals, identified in some cases by the widespread presence of certain organisms and in others by particular environmental conditions. The oldest and also the longest geological era (lasting about 4 billion years) is the Archeozoic, characterized by intense magmatic activity and the presence of only the most elementary forms of life. Among the many folding episodes that must certainly have occurred

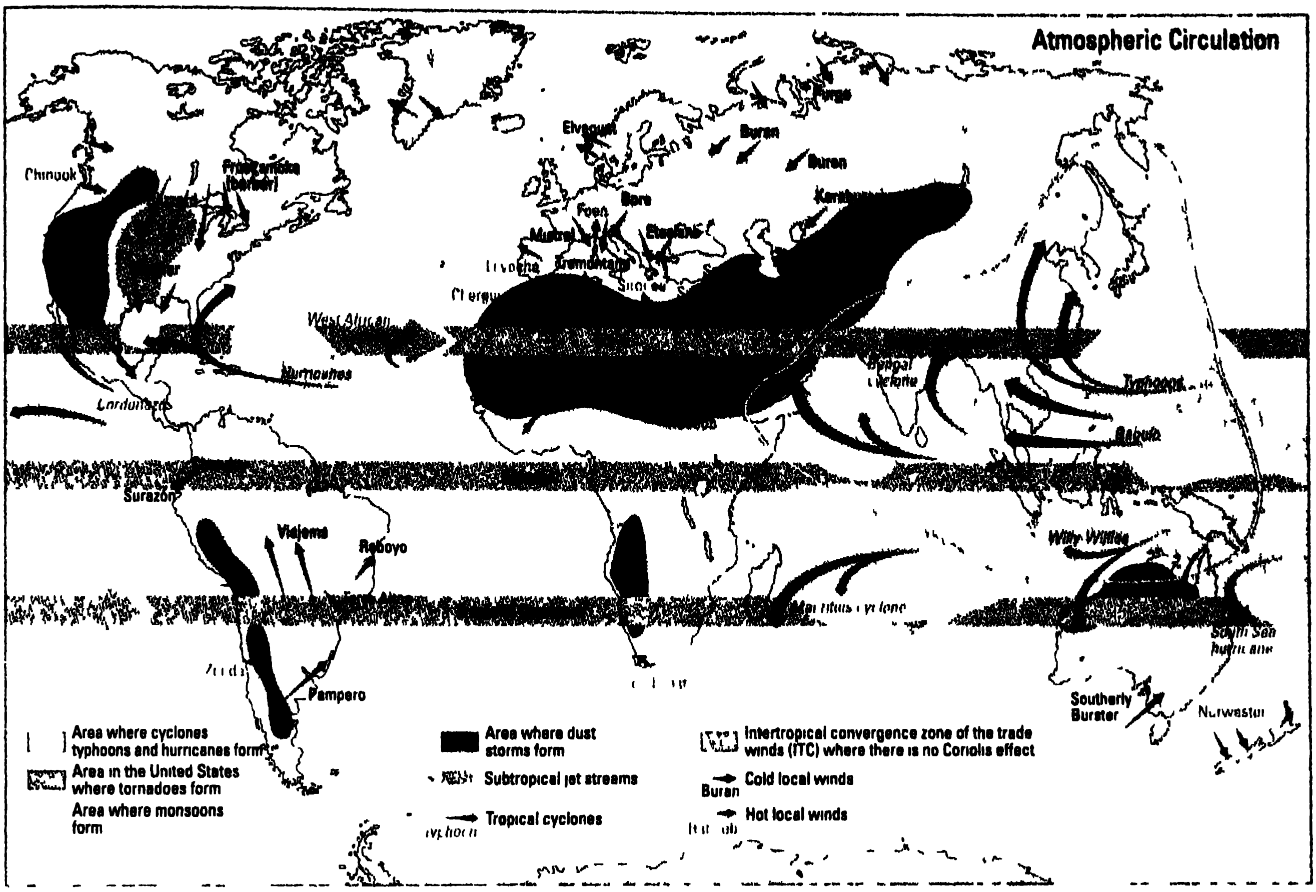


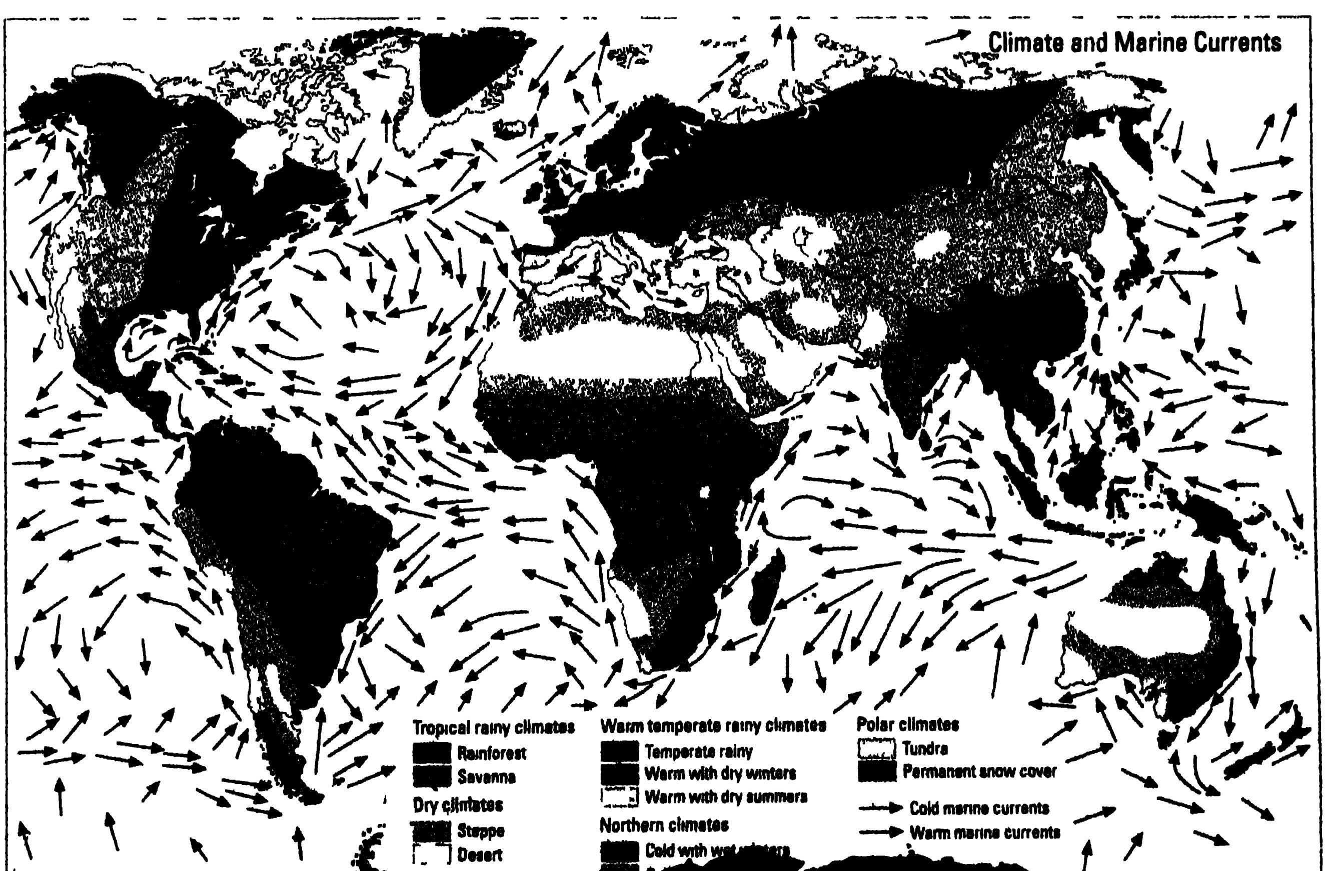
during this era, there remain faint traces of one orogeny, called the Hūronian after Lake Huron. Events during the succeeding Paleozoic era, which lasted about 370 million years, are much better understood. It was characterized by considerable diffusion of living beings, especially plants, which toward the end of this era formed large forests which today have been converted into huge deposits of fossil carbon (coal). In the animal world, considerable development of marine invertebrates was followed by the appearance of higher species, such as fish, amphibians, and reptiles, indicating that life was gradually moving onto dry land. The principal folding phases are represented by the Caledonian orogeny, which occurred about 400 million years ago, and the Hercynian, dating to 250 million years ago and responsible for the formation of many mountain ranges that still exist. The Mesozoic era was shorter (160 million years) and characterized on the one hand by a great expansion in the oceans (Europe and Africa were separated by the Tethys Sea during this time) and on the other hand by the appearance of the first mammals, accompanied by the development of the dinosaurs (who then became abruptly and mysteriously extinct), other marine organisms such as ammonites, and the first birds. During this geological era tectonic disturbances were relatively modest. The Cenozoic era that followed was even shorter (about 63 million years); during this time the biological world experienced considerable renewal and the various species began to take on characteristics more and more similar to those of the present day: certain invertebrates (nummulites) were widely distributed, and mammals were abundant on land.

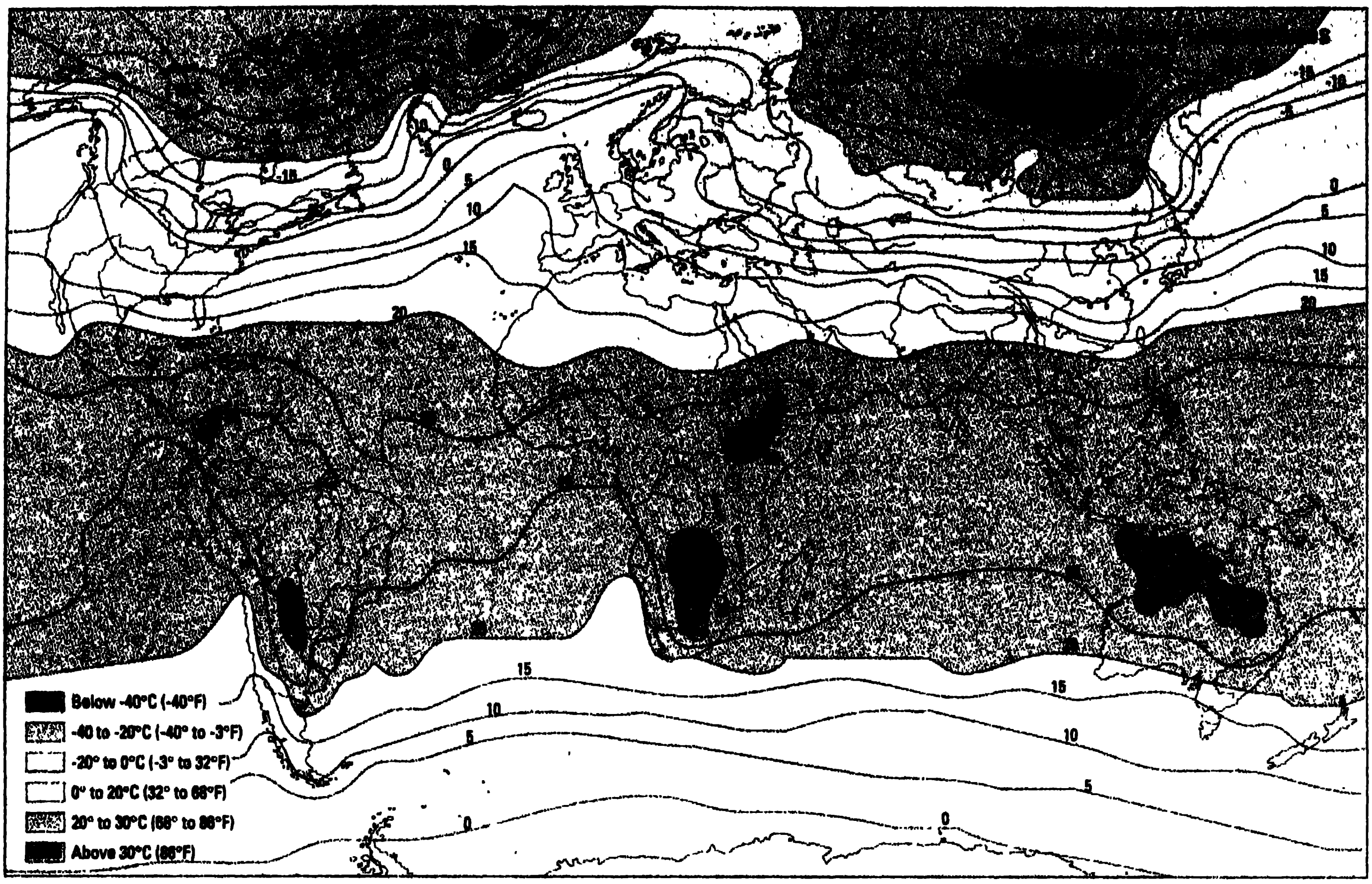
The Cenozoic era was also affected by the Alpine-Himalayan orogeny, which is responsible for establishing essentially the present-day fundamental structure of our planet's relief. This folding episode was also accompanied by intense seismic and volcanic activity, which has continued down to the present. The present Quaternary period began barely two million years ago. It is only since then that the evolution of higher mammals led to the appearance of the human species and its spread over the entire Earth. It was also during these last two million years of the Earth's history that major and repeated climatic changes have occurred, characterized by large areas of ice that have greatly influenced landforms. The most recent ice sheet receded only 12,000 years ago.

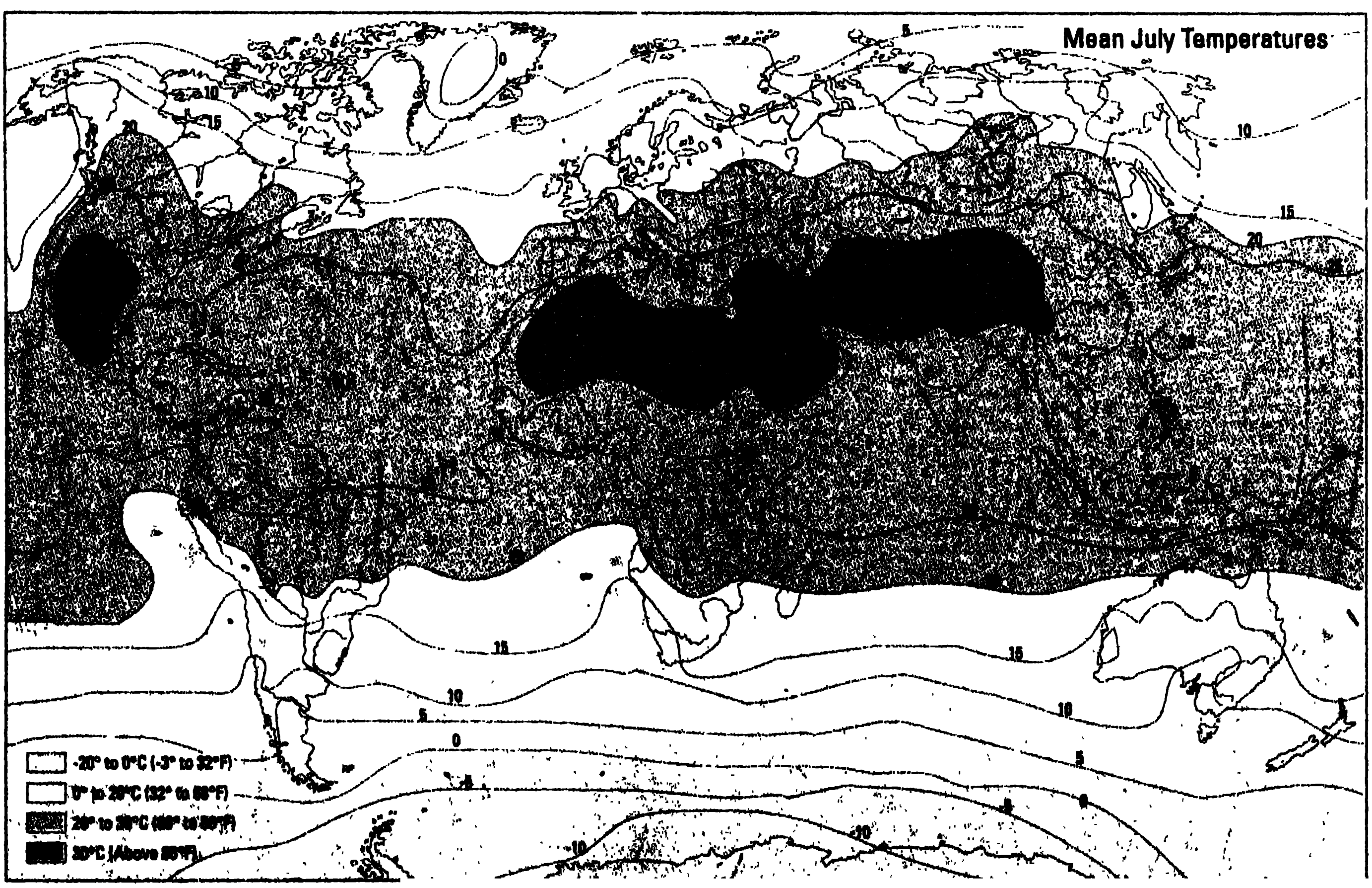
The atmosphere. ***The structure of the atmosphere.*** The outermost fluid layer that completely envelops the Earth's surface, the atmosphere, consists essentially of a mixture of gases (about 21% oxygen and 78% nitrogen, a little less than 1% argon, and minimal quantities of other noble gases, water vapor, carbon dioxide, and ozone). It is approximately 600 mi [1000 km] thick, with most of these substances concentrated in the lowest layers. These layers constitute the "troposphere," whose thickness varies from 5 mi [8 km] at the poles to 7.5 mi [12 km] at the equator; within it occur almost all the phenomena which most directly influence the Earth's surface and the organisms that live there. These include most of the movements of air masses that continually change weather conditions on local and regional scales. Within the troposphere, air temperature tends to decrease from sea level upward, dropping to very low levels (−65 to −75°F [−55° to −60°C]). Above this




Atmospheric Circulation
Chinook
Buran
Buran
Bora
Foen
Mistral
Tramontane
Etesians
Typhoons
Surazo
Reboyo
Pampero
Southerly Burster
Area where cyclones typhoons and hurricanes form
Area in the United States where tornadoes form
Area where monsoons form
Area where dust storms form
Subtropical jet streams
Tropical cyclones
Intertropical convergence zone of the trade winds (ITC) where there is no Coriolis effect
Cold local winds
Buran
Hot local winds


Climate and Marine Currents
Tropical rainy climates
Rainforest
Savanna
Dry climates
Steppe
Desert
Warm temperate rainy climates
Temperate rainy
Warm with dry winters
Warm with dry summers
Northern climates
Polar climates
Tundra
Permanent snow cover
Cold marine currents
Warm marine currents


Below -40°C (-40°F)
-40 to -20°C (-40° to -3°F)
-20° to 0°C (-3° to 32°F)
0° to 20°C (32° to 68°F)
20° to 30°C (68° to 86°F)
Above 30°C (86°F)


Mean July Temperatures
-20° to 0°C (-3° to 32°F)
0° to 20°C (32° to 68°F)
20° to 30°C (68° to 86°F)
30°C (Above 86°F)

lies the "stratosphere," with an average thickness of about 12 mi [20 km], within which air temperature remains practically constant. Atmospheric pressure decreases to about a tenth of the sea-level value at the upper limit of the troposphere and to about a hundredth at the edge of the stratosphere. The upper layer of the stratosphere, called the "mesosphere," is about 30 mi [50 km] thick; within it, temperature rises considerably for a certain distance before dropping again, at the upper edge, to about −100 to −110°F [−75° to −80°C]. Above this begins the "ionosphere," where temperature rises indefinitely and atmospheric pressure decreases to practically negligible values. The pressure at sea level is 29.92 in. Hg [1013 millibars], equivalent to the weight of a column of mercury 29.92 in. [760 mm] high with an area of 0.155 in^2 [1 cm^2].

It should also be remembered that specific phenomena and conditions occur in the various layers of the atmosphere. The upper stratosphere, for example, contains a substantial quantity of ozone (an allotropic form of oxygen with a triatomic molecule); this gas absorbs ultraviolet radiation emitted by the Sun, thus acting as a protective shield for the Earth's surface and for living organisms. The ionosphere, on the other hand, is the scene of phenomena such as the auroras.

Tropospheric phenomena. The troposphere is particularly dense as compared with the remainder of the atmosphere (and contains three quarters of its mass); it is also distinguished by the homogeneity of its composition and the regularity with which physical parameters such as temperature and pressure change within it. The negative gradient of these two magnitudes is approximately 3°F per 1000 ft [6°C per 1000 m] for temperature and 0.9 in. Hg per 1000 ft [100 millibars per 1000 m] for pressure, obviously under standard conditions (in the absence of meteorological disturbances).

Although it is clear why pressure decreases with altitude, the same is not true for temperature. A certain amount of energy arrives from the Sun at the outer edge of the atmosphere; about half of it (51%) manages to reach the Earth's surface either directly or indirectly, while some is absorbed by the atmosphere and powers the processes that occur there, and some is reflected outward. The energy absorbed by the Earth is in turn fed back into the atmosphere, which is thus heated from below. The heat emitted by the Earth can also be retained by particularly dense atmospheric layers or even by clouds, and reflected back toward the ground, in what is known as the "greenhouse effect."

The spherical shape of the Earth is the principal reason why air pressure and temperature change not only with altitude, but also with latitude. Temperature tends to decrease continuously from the equator toward the poles, and diametrically opposite situations therefore occur in the two hemispheres (as a consequence of the inclination of the Earth's rotation axis with respect to the plane of the ecliptic). Pressure experiences similar but less obvious changes: the low temperatures at the poles mean that the air is generally cold, and therefore denser than in the temperate and intertropical zones. In addition, the presence of huge areas of liquid, such as the oceans and seas, continually replenishes atmospheric moisture by means of evaporation, which is more intense in hotter areas. As a consequence one can identify, again within the context of the troposphere, a series of air masses with different chemical and physical characteristics that are closely linked to the nature of the geographic areas over which they are normally located. An air mass located above an ocean, for example, is generally moist, and one located above the intertropical zone is obviously warm.

When two air masses with different chemical and physical characteristics meet, meteorological disturbances of occasionally substantial size can occur in the contact zone (called a "front"). Usually a moving air mass is referred to by way of the advancing frontal surface: we therefore talk about cold front and warm fronts, or polar fronts and tropical fronts. Looking at the barometric conditions of an air mass, we find that they are not necessarily always constant; a pressure gradient may be present, for example, forming two distinct zones at higher and lower pressure (referred to respectively as an "anticyclone" or "high" and a "cyclone," "low," or "depression"), in which the air takes on a rotary motion, divergent in the first case and convergent in the second. Air also tends to move from the anticyclonic to the cyclonic part until pressure equilibrium is restored. This mechanism, which can be regulated by temperature (since heated air expands, becomes lighter, and tends to rise, while cold air contracts and tends to sink), is often also triggered by dynamic processes which in turn result from local or planetary phenomena. Such is the case with the "chinook," a wind triggered by the eastward passage of a depression across the Rocky Mountains; air flows down the eastern slope, becomes compressed, and heats up, causing rapid melting of snow and ice. Certain regularly occurring winds called "breezes" are also of purely local significance: they result from differences in temperature and therefore pressure which are present along coastlines (sea and land breezes), or along mountain slopes (mountain and valley breezes).

In more global terms, it is possible to set forth a general outline of atmospheric circulation within the troposphere. Low pressure areas, with rising air currents, predominate at the equator; a zone of high pressure, predominantly over the oceans, extends to the tropics; low pressure again prevails near the Arctic and Antarctic Circles, while permanent high pressure masses are located at the two poles; lastly, the great continental air masses are dominated by high pressure in winter and low pressure in summer. Although this outline suggests a fairly rigid circulation pattern, it is in fact modified by other situations, some of them familiar since antiquity and others discovered only recently. The intertropical zones are characterized by winds which blow toward the equator, diverted to the west by the Earth's rotation. These are the "trade winds," so called since ancient times; they blow all year, with fluctuations in latitude depending on the Sun's maximum elevation through the year. Also present in the tropical zone are the "monsoons," once believed to represent breezes on a vast scale. In fact, they are governed by the westward equatorial air current and by oscillations in the trade winds, which are forced to change direction when they cross the equator.

Certain phenomena observed during World War II led to the discovery of two gigantic atmospheric flows that move from west to east at middle latitudes in both hemispheres: these are the "jet streams," which move at speeds of 185–250 mph [300–400 km/h] and altitudes that vary from 13,000 to 26,000 ft [4000–8000 m], with considerable variation in latitude. Instead of moving in a straight line, they meander like snakes, forming a series of curves that are often so close together as to produce

rotary motions or eddies; these give rise to anticyclonic and cyclonic cells which always move from west to east, although much more slowly. The jet streams appear to play an important role with regard to certain winds closer to the surface, such as the familiar westerlies that blow constantly from west to east in the middle latitudes.

One particular atmospheric phenomenon that occurs especially in the tropics consists of tropical storms, also called "hurricanes" or "typhoons." There are cyclonic disturbances that form over the oceans and then move toward island groups and continents farther west, where they release their enormous quantities of energy embodied in wind speeds of between 60 and 185 mph [100–300 km/h].

The presence in the troposphere of even a small quantity of water in the form of vapor (humidity) engenders some very important effects, especially insofar as the Earth's surface and living beings are concerned. Derived from the evaporation of ocean and sea water, but also from the continents and from the transpiration of plant life, atmospheric moisture exists in this environment in a rather unstable equilibrium, since its concentration depends on air temperature. The warmer the air, the greater the amount of moisture it can hold, while even a slight cooling of the atmosphere can result in sudden condensation of the moisture that it contains. As it condenses, the moisture converts into the liquid state, so that the water vapor becomes tiny droplets of water so light that they float in the air, sometimes forming the gigantic accumulations we call clouds. As many droplets merge together, they create larger and heavier drops which fall to the ground as rain. This, in oversimplified terms, is the mechanism by which precipitation occurs; it can involve a variety of processes and forms, including solids (snow and hail). The mechanism that leads to the condensation of atmospheric moisture can also proceed in numerous ways, for example, moist air can be cooled if it rises due to convecti or if it comes into contact with colder air.

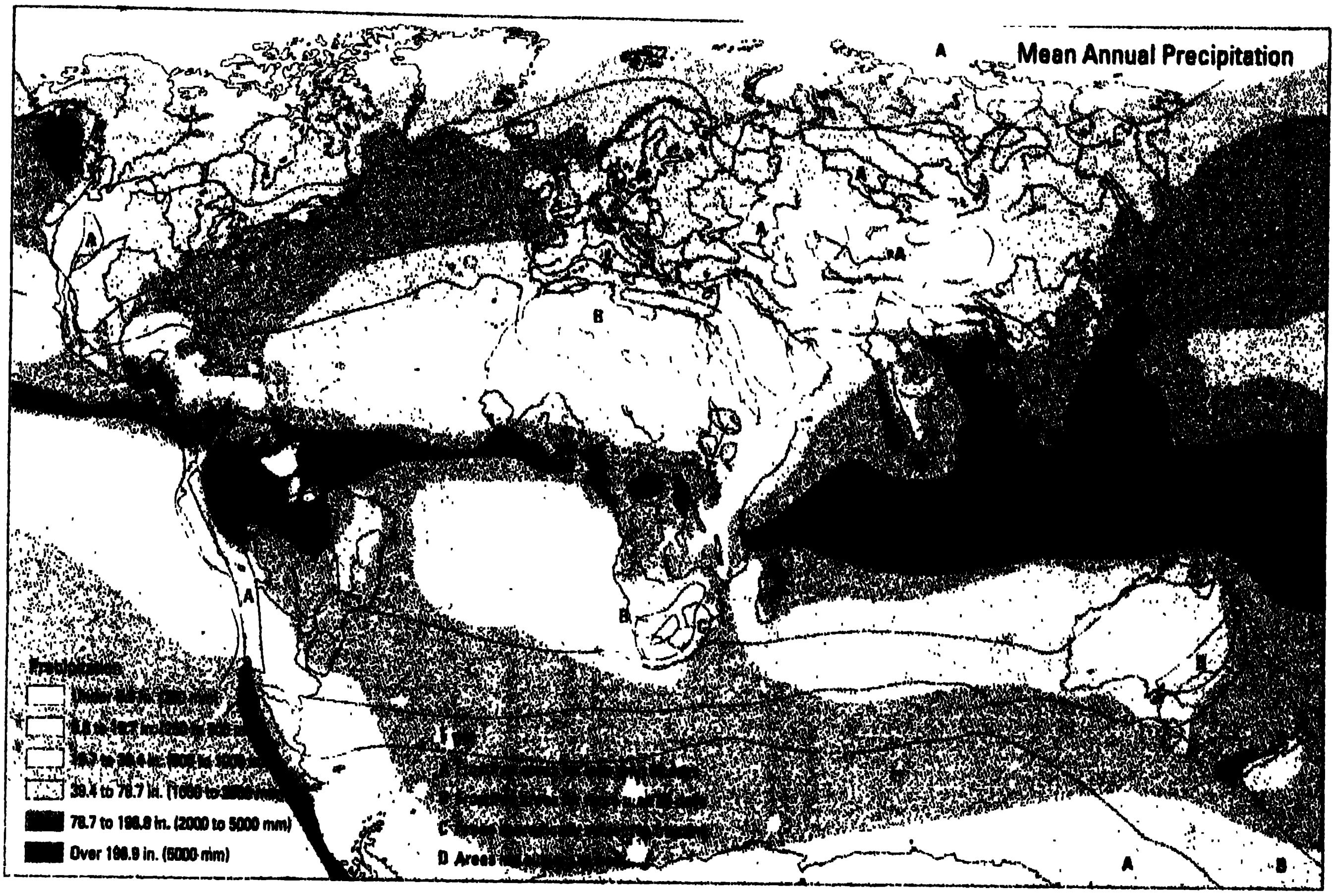
Weather and climate. The terms "weather" and "climate" are used quite routinely to refer to both local and general meteorological conditions, although the two words have very specific and different meanings. Weather is generally understood to mean the meteorological conditions (expressed as precise values for certain parameters such as temperature, pressure, relative humidity, and cloud cover) existing at a specific point on the Earth's surface at a particular moment. For example, stating that at 3:00 p.m. on July 14, 1989, the temperature as measured at the Observatory in Paris was 77°F [25°C], the pressure 29.83 in. Hg [1010 mb], and the relative humidity 85%, does not mean that those conditions remained the same for the entire day at that location. "Weather" is therefore a real concept referring to a situation that may be transitory, but can readily be measured with the right instruments: it is therefore an entirely objective fact.

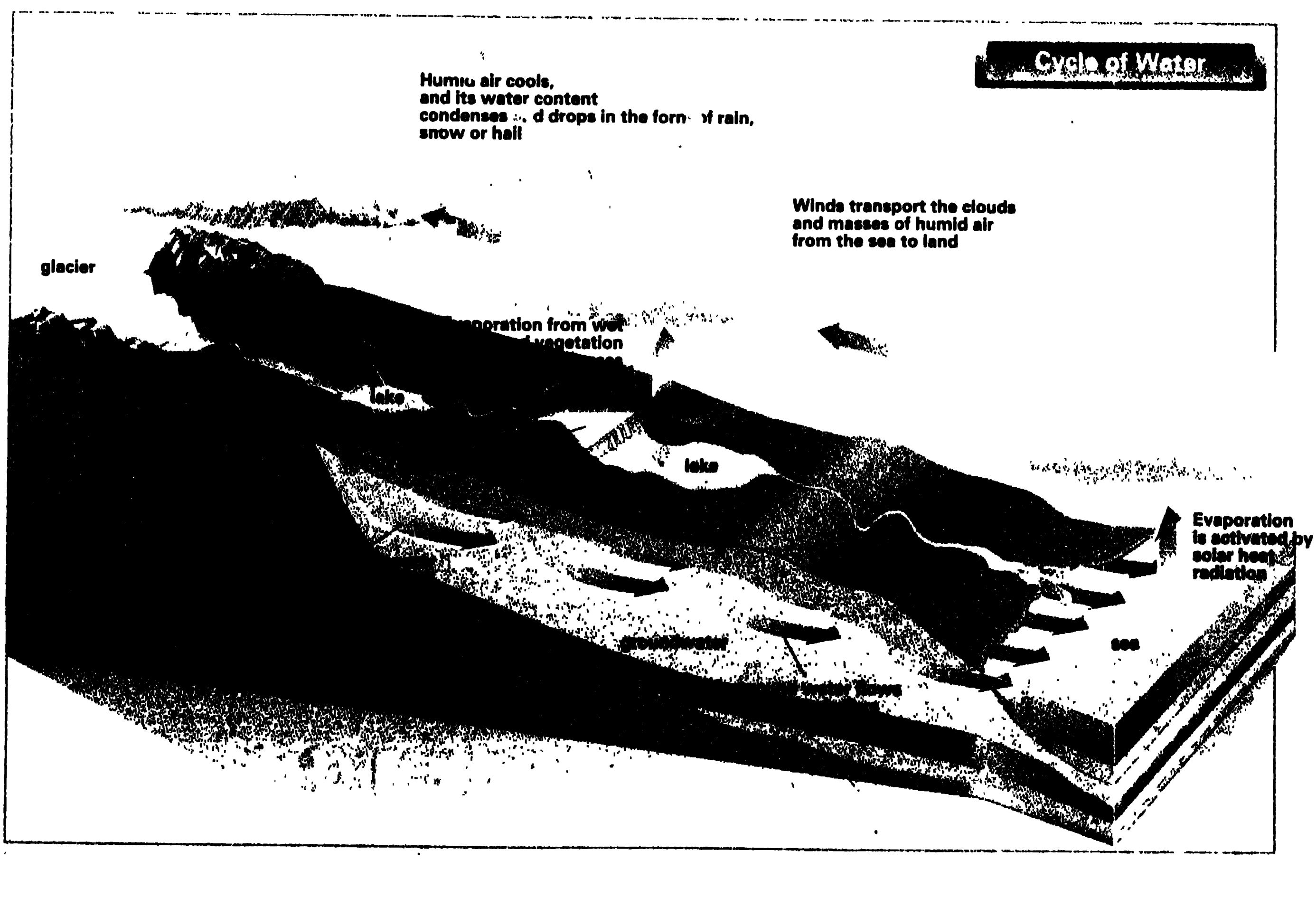
The concept of climate, however, is very different: this word means the average state of the atmosphere (construed as its basic parameters such as temperature, pressure, and humidity, the latter expressed in the form of precipitation) that characterizes a particular portion of the Earth's surface over an entire year and tends to repeat itself, albeit with some variations, in succeeding years, to the point that it becomes a geographical component of the territory in question. Thus even if it is based on concrete observations (the sum total of all the types of weather that occur during a year at the various points within a single territory, and then the manner in which they repeat over a period of many years), the concept of climate takes on a predominantly subjective and to some extent abstract significance, precisely because of the subjectivity that can be applied to the interpretation of individual meteorological data, not to mention the definition that is then given to that specific type of climate whose elements manifest themselves to varying degrees. For example, when referring to a climate in the tropics, it may be significant to determine whether it is humid, or dry, or has seasonal variations in moisture, even if the temperature component is constant.

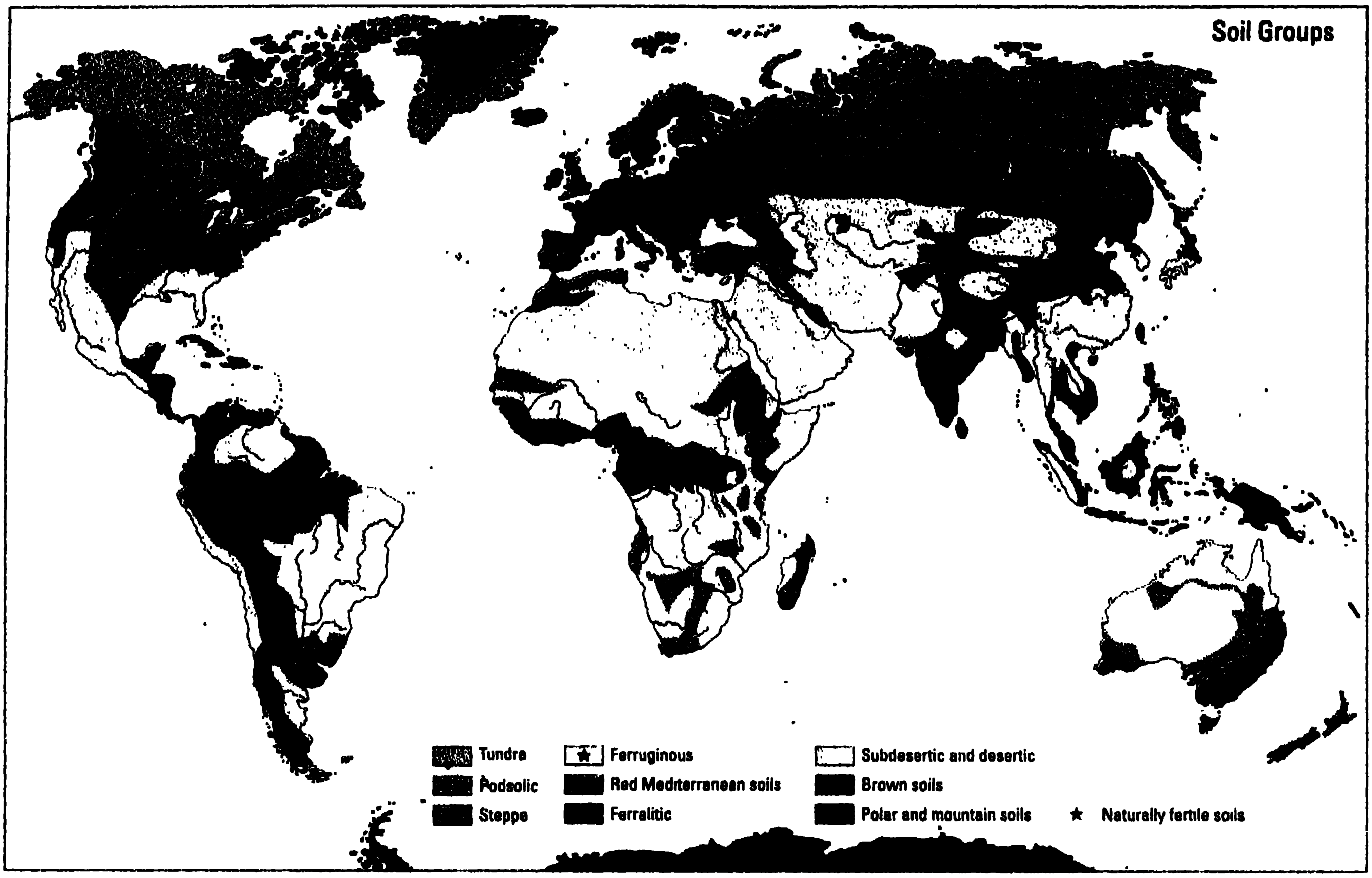
The abstract nature of the idea of climate becomes even more evident when one considers the numerous classifications that have been proposed, some based on an emphasis on certain parameters (temperature or humidity), others on reference to the undoubted effects that climate has on the physical environment and in particular on the biological world, for example on vegetation (see the Biosphere section, below).

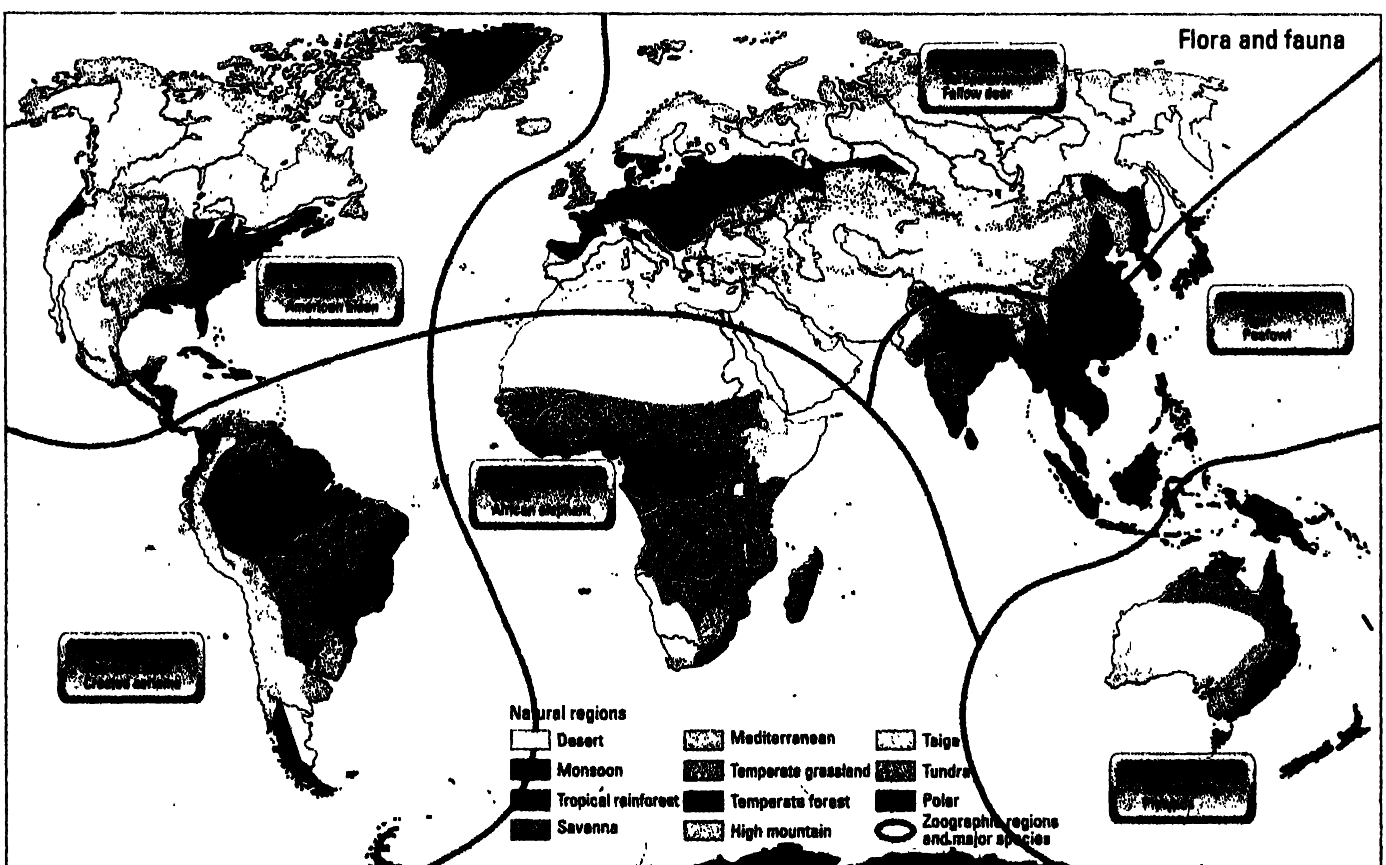
Nevertheless, the generalization implicit in any concept of climate can be used to make numerous comparisons and to evaluate in holistic terms the many interrelations between climate and the other physical and biological components of the Earth's surface. It also offers a way to determine the actual influence exerted on the distinctive elements of climate (temperature, pressure, humidity) by geographical and astronomical factors that are normally independent of it, such as latitude, elevation, relief, and geographical position in terms of proximity) or distance fro sources of moisture such as oceans. The latter factor give to a distinction between maritime and continental first generally humid and the second

matic classifications that have been proposed, th mulated by the German meteorologist W'dimir I in 1931 still remains useful, not least because it can be correlated with plant environments. It is based on combining th various types of climate into five major groups, distinguished from one another on the basis of differences in temperature and humidity. The first group includes moist tropical climates, characterized by an average temperature above 64°F [18°C] in the coldest month; these include the constantly humid equatorial climate, the monsoon climate with one wet season, and the savanna climate with two short wet seasons and two dry periods. The second includes arid climates (steppe or desert). The third comprises what are called mesothermal climates (moist and warm temperate), characterized by an average temperature of between 64°F [18°C] and 27°F [–3°C] in the coldest month. Members of this group include the tropical mountain climate governed by elevation; the classic Mediterranean climate with a dry summer, winter precipitation, and modest temperature swings (differences between average extreme temperature values); and the constantly moist temperate oceanic climate. The fourth group contains boreal or microthermal climates, with an average temperature below 27°F [–3°C] in the coldest month and above 50°F [10°C] in the hottest month; a dry season (winter in the typical Siberian climate) may or may not be present. Lastly, the fifth group includes the frigid climates typical of the polar regions, with an


Mean Annual Precipitation
78.7 to 196.9 in. (2000 to 5000 mm)
Over 196.9 in. (5000 mm)


Cycle of Water
Humid air cools,
and its water content
snow or hail
Winds transport the clouds
and masses of humid air
from the sea to land
glacier
lake
lake
Evaporation
is activated by
solar heat
radiation
sea


Soil Groups
Tundra
Podsolic
Steppe
Ferruginous
Red Mediterranean soils
Ferralitic
Subdesertic and desertic
Brown soils
Polar and mountain soils
★ Naturally fertile soils


Flora and fauna
Natural regions
Desert
Monsoon
Tropical rainforest
Savanna
Mediterranean
Temperate grassland
Temperate forest
High mountain
Taiga
Tundra
Polar
Zoographic regions and major species

average temperature of less than 50°F [10°C] in the warmest month and therefore no trees; these are the tundrà and permafrost climates.

The hydrosphere. ***The hydrologic cycle.*** The close contact that exists among the Earth's three outer coverings—the hydrosphere, atmosphere, and lithosphere—inevitably creates interrelations; such interrelations are demonstrated by the complex series of processes referred to as the hydrologic cycle or water cycle, which also indicates something about the extreme mobility of the phenomena that take place on the Earth's surface.

Normally the atmosphere's moisture is replenished by evaporation from the oceans, which occurs at all latitudes but with greater intensity in the tropics. Condensation of atmospheric moisture in turn produces cloud systems which then discharge onto the Earth's surface in the form of precipitation. Once it arrives on the ground, rainwater can take a number of routes: it infiltrates into the soil and feeds into underground water tables, from which it re-emerges as springs; it is absorbed by plants (leaves and roots) and is given off by them in turn as water vapor; most of it runs off the surface of the soil to feed into watercourses (brooks, streams, rivers, etc.); or it soaks into upper soil layers where it activates processes of pedogenesis (see below), creating more soil in which vegetation can take root.

Water returns to the sea in rivers, thus completing its cycle. The engine powering this cycle consists of both solar radiation, which provides the energy for evaporative processes, and the force of gravity, which facilitates rainfall and both surface and underground water runoff. It is also important to remember that living organisms, especially plants, are also involved in the water cycle.

Water in the oceans and seas. The distinction between "ocean" and "sea" is a conventional one: seas are smaller areas of oceans, generally surrounded by land but always communicating with the ocean (the Mediterranean is one example). Otherwise they differ little in essential characteristics, except in certain specific cases: one is the limited mixing between the Atlantic and the Mediterranean due to the presence of a rocky "threshold" across the strait of Gibraltar. In more general terms, however, the word "seas" indicates the entire liquid mass which completely surrounds the world's dry land.

The characteristic which most clearly distinguishes marine water is its salt content or salinity. Ordinarily, each quart of sea water contains about 1.1 oz [35 g/liter] of salts (predominantly sodium chloride and magnesium chloride). This value, which is expressed in parts per thousand, can nevertheless vary with latitude and temperature (since it is influenced by evaporation), and in extreme cases can exceed 40 parts per thousand (Red Sea) or drop below 20 per thousand (Black Sea).

Because of its salt content, sea water has a higher specific gravity than fresh water and therefore freezes at a lower temperature (about 28°F [-2°C]). Although surface ocean temperatures generally reflect those of the atmosphere above, ocean water becomes rapidly colder with increasing depth, reaching 50°F [10°C] at about 1600 ft [500 m], after which the gradient flattens out and the temperature decreases more slowly, attaining values close to 32°F [0°C] in the abyssal depths.

Contact with the atmosphere produces a series of apparently irregular movements at the surface of the seas, represented by wave motion. This consists of a series of harmonic oscillations of the water particles in the uppermost layers, in which the vertical component predominates. It is only near land that the horizontal component tends to prevail, forming rollers and breakers which possess considerable erosive capability.

Other movements affecting ocean waters are those represented by the tides—a familiar phenomenon which consists of a periodic rise and fall in sea level due to the attraction exerted on the Earth by the Moon—and by ocean currents. The latter, representing true rivers flowing at the surface of the seas, are identified by their temperature, salinity, and occasionally color, all of which generally differentiate them very clearly from the surrounding waters. Currents are therefore identified as "cold" (at a lower temperature than the water around them) or "warm" (higher temperature). Density is another characteristic identifying ocean currents, which can circulate in patterns of truly oceanic scale. One of the best known currents is, of course, the Gulf Stream, which originates in the Gulf of Mexico and then flows across the Atlantic toward the coasts of northwestern Europe, bringing the benefits of its higher temperature. Ocean currents can flow not only at the surface but also at depth; their movements, which are convective in nature, are triggered by differences in temperature and density between deep water and surface water. Complex systems of currents can also occur at various depths in enclosed seas such as the Mediterranean, generated by the particular configuration of the coastline.

Water on the continents. Once rainwater has fallen to the ground, it tends to flow into furrows which gradually become broader until they take on the form of true valleys containing rivers and streams. The distinction between these two terms is often purely formal; a stream is generally understood to be a shorter watercourse than a river, with a greater slope and a certain irregularity in its behavior.

In addition to length and slope, the characteristic elements of a watercourse include its hydrographic "basin" (that area in which the surface drainage conveys all precipitation into the main watercourse); its "discharge" (the volume of water carried by the river for each unit of time, usually measured in cubic feet (or cubic meters); and the "regimen," which represents the total variation in flow over the course of a year. The flow rate of a watercourse generally depends on the size of its basin and the quantity of precipitation it receives, while the regimen is also associated with rainfall. When the flow rate reaches higher values, it is said that the watercourse is in flood; lower values characterize the "low water" phase.

If a river's course runs through a depression enclosed on all sides, it may fill it up with water and form a "lake." This term therefore refers to any land depression, no matter how small, that is occupied by water. It can be fed and drained by tributaries and effluents; if these are absent, its presence is governed by the relationship between precipitation and evaporation. Lake basins vary a great deal in origin, but they generally depend on local tectonic and morphological conditions. The water in lakes is also normally saltier than in rivers, but less so than in the sea. Only in the presence of intense evaporation in tropical regions will its salt concentration rise appreciably, leading to the formation of thick salt deposits. Lakes also have a definite climatic influence when their water mass reaches

substantial proportions (as in the case of the Great Lakes of North America).

One particular aspect of continental waters is the enormous masses of ice that cover the polar regions, such as Antarctica and Greenland; these are the remains of even greater and more extensive ice sheets that were present on Earth during the first part of the Quaternary period (Pleistocene epoch). In other regions, especially on higher ground above a certain elevation (called the snow line, an elevation which tends to decrease from equatorial regions, where it lies at 16,000–20,000 ft [5000–6000 m], toward the poles), the accumulation of snow that does not melt before the next winter leads to the formation of huge quantities of ice, which is produced as the snow is gradually compressed and all the air within it is expelled. Under the action of gravity, that ice will then tend to slip downward. The result is the formation the typical tongues of ice called glaciers, which have immense power to erode and reshape landscapes.

Not all of the Earth's dry land is covered with a network of watercourses; in places where precipitation is extremely sparse or entirely absent, surface drainage also disappears. These regions usually correspond to desert areas. Regions in which surface drainage never reaches the sea, but rather flows into enclosed basins are termed "endorheic," while all the other parts of the Earth in which drainage flows ultimately into the sea are considered to be "exorheic."

The shaping of the Earth's surface. ***Morphogenic agents and processes.*** No sooner than the Earth's relief is created as a result of deformations to the crust produced by internal (endogenous) forces (predominantly tectonic, but also seismic and volcanic), it is immediately attacked by other forces, external to the Earth's surface, represented by all those phenomena that occur within the atmosphere and hydrosphere: wind, precipitation, running water, glaciers, wave motion, and the like. Added to these is the action of living beings and of humans in particular, which can produce considerable morphological changes to the environment.

The effect of these external or "exogenous" forces is to produce actual erosion of the rocks that outcrop at the surface. These are thus transported downward and later deposited in valley bottoms, in lake basins, and especially in the sea. Erosion, transportation, and sedimentation are thus the fundamental exogenous effects whose mechanisms, at times highly complex, shape the world's landscapes and give them the morphological characteristics which often unmistakably identify them.

One morphological agent of considerable importance is the force of gravity, which causes eroded materials to travel downward along valley slopes (thus causing the accumulation of occasionally substantial layers of detritus) and to be transported by running water. Gravity also controls the many types of crumbling movements which affect regions with low geological stability.

Atmospheric agents—wind, temperature changes, and precipitation—are also of major importance. The wind acts by lifting and transporting (or deflating) finer material from the ground and hurling it against rocks, which are rubbed away (corrasion) and thereby eroded. Frequent changes in air temperature produce repeated expansion and contraction of rocky materials, which are thereby weakened and exposed to further erosion. One very important agent in this context is ice, which can ultimately fracture even the hardest and strongest rocks. Lastly, rainwater, generally carrying dissolved carbon dioxide, causes chemical dissolution (karstification) of certain rocks such as limestone and gypsum, especially if they are already fissured; this produces underground voids (caves, with their characteristic dripstone deposits consisting of stalactites and stalagmites), and depressions of various sizes on the surface (sinkholes). Rainwater can also result in perceptible mechanical erosion when it strikes soils and rocks that have little strength (sands and clays), leading to the development of deep incisions (gullies) and other striking morphological effects.

Glaciers and wave action have particularly impressive erosive effects, and are responsible for much of the present-day appearance of landscapes both inland and on the coasts. As glaciers move downward, they produce vigorous erosion of the valley bottoms in which they slide while the ice itself is in turn consumed by attrition and by the action of higher surface temperatures (ablation). Material eroded by the glacier is ultimately dragged to its leading edge and sides, forming characteristic accumulations called moraines. The valleys excavated by glaciers, in which erosion also occurs laterally, take on a typically concave shape with a flat, wide U-shaped bottom, unlike the V-shaped valleys cut by running water. The erosion produced by wave action on sea coasts, however, is predominantly mechanical (abrasion), and can cause coastlines to recede very rapidly. When vertical walls (cliffs) are present along high, rocky coasts, the sea will often dig out niches and caves, which in the past were used as shelters and dwellings by primitive humans. The action of the sea along coastlines does not just involve erosion; it also tends to accumulate material (generally sand) discharged by rivers and transported by coastal currents. The result is the building up of coastal bars and barrier islands which enclose large areas of water within them (lagoons). The action of running water (rivers and streams) is also predominantly mechanical. Once it has been eroded, material is transported downward. The river then gradually deposits first the coarser and heavier material, then the finer and lighter components (gravel and sand); what arrives at the mouth of the river is generally the finest materials (mud and clay), which are deposited very slowly. During floods, these materials may also include pebbles and sand, which are discharged into the sea and then deposited on the continental shelf. River mouths can also take on different forms depending on conditions, which may impede or promote the deposition of alluvial material ("alluvium" is the term generally used to describe materials transported by rivers): if deposition is impeded, the river forms an estuary (a wide, deep mouth that is often tidal for some distance inland); if conditions favor it, the result is a delta, a fan-shaped mass of deposits radiating from the river mouth into the sea, with an extremely variable shape through which numerous channels often flow.

One last typical aspect of the morphogenic action of watercourses is represented by terraces, steps cut by a river into its own sediments after it resumes erosive activity in the lower part of its course. In addition, when a tributary enters from the side of the valley containing the principal watercourse, it deposits all the material it was transporting, forming a charac-

teristic conical accumulation (the detritus cone or conoid), which further articulates the morphological landscape.

The origin and distribution of soils. The uppermost part of the Earth is finely broken down by the action of atmospheric agents, thus allowing running water to soak in. When this water evaporates, it not only precipitates salts but also causes remixing of previously disintegrated material, in which animals and plants can now reside. As this process (called pedogenesis, or soil formation) proceeds, it leads to the formation of a surface layer of humus, a material made mostly of decomposed organic matter mixed with chemical and mineral substances particularly suited for absorption by vegetation. The chemical and mineralogical composition of a soil generally depends on the nature of the underlying rock (parent rock) from whose breakdown it originated. Because of their particular structure, however, soils have a very delicate equilibrium and can easily be eroded or totally removed, with highly negative effects on the plant cover and on other organisms that are linked to it; this is particularly devastating in the case of forests.

The distribution of soils around the Earth depends not only on lithological conditions but also to a large extent on climatic conditions and the plant environment. The most familiar soil types include podzols, or gray soils, typical of boreal regions with conifer forests; brown soils that support broadleaf forests in temperate regions; and the chernozems, or black soils typical of the European and Asian steppes, highly suitable for grain cultivation. The soils typical of Mediterranean regions, however, are called "terra rossa" (red Earth); these predominantly clay soils form from the dissolution of limestones. Soils frequently found in tropical regions include laterites, reddish clay soils that form in hot, humid environments with a great deal of evaporation.

The biosphere. *The distribution of organisms.* On the Earth's surface, and partly interpenetrating the hydrosphere and atmosphere, is another covering around the Earth: this is the biosphere, or the assemblage of all living organisms (plant, animal, and human), whose distribution depends on many factors—lithological, morphological, climatic, and ultimately biological. Moreover, it has changed profoundly over time, especially after the appearance of humans, who have attempted to exterminate or reduce those species which they did not believe useful and promote the distribution of others by means of typical activities such as agriculture and stock raising. Gradually this merged into a phase of genuine aggression against natural resources, the risks of which were described many years ago by the anthropologist Camille Arambourg:

> *In a very short time, modern humans have profoundly altered the biological equilibrium of the planet, and it is possible that we are beginning to see the consequences of this fact. They have destroyed most of the large animal species and changed the distribution of the rest, and done the same for plants; they have multiplied at a dizzying pace, to an extent that now worries sociologists. What is more, now that they have gradually exhausted the natural resources that are essential for their survival, their entire material and social life is more and more closely linked to the possession or conquest of resources that are likely to run out; little by little, they are replacing their natural, original biotope with an artificial biotope to which they are becoming progressively enslaved.*

The distribution of animals over the Earth's surface, based on the particular characteristics of each individual species, can be used to identify a certain number of zoogeographic regions, each with fairly homogeneous characteristics. North America as far as central Mexico constitutes the Nearctic region, while Central and South America and the Caribbean area form the Neotropical region. Australia and Oceania represent the Australian region, while the Old World is divided into three principal regions: the Palearctic with Europe, northern Africa, and north-central Asia, the Ethiopic region comprising central and eastern Africa and Arabia; and lastly the Oriental region with south and southeast Asia.

Because of the particular nature of plants, the distribution of vegetation is based on predominantly climatic and edaphic (soil-related) criteria. The term "plant community" is used to describe a vegetational unit with a specific composition, that has developed certain characteristics under uniform environmental conditions; a vegetation "formation," on the other hand, refers to an assemblage of related plant communities understood in the geographic sense (rainforest, savanna, meadow, and so on; see below).

A better understanding of the problems and considerations relating to the distribution of organisms on Earth requires a clear awareness of the significance of certain concepts, especially those of "environment" and "ecosystem." The term "environment" can mean the totality of all terrestrial physical conditions and organic phenomena capable of influencing living organisms. An "ecosystem," on the other hand, is a complex of coexisting organisms and physical phenomena in terms of the interdependence among them, characterized by interactions consisting of interchanges of matter and energy.

Bioclimatic landscapes. The classification of climates outlined above will provide a better understanding of the geographical distribution of the principal plant formations which, together with morphological conditions, help better delineate certain aspects of the natural landscape.

The hot and hot-humid climates of the tropical region are still characterized by large areas of evergreen equatorial forest, constantly supplied with precipitation, rich in valuable species, and with a considerable variety of spice plants. As one moves away from the equator and as precipitation patterns change with the Sun's position in the sky, the forest thins out and the predominant formation becomes the savanna, realm of the grasses, with few trees. At these latitudes, a lush forest develops only in monsoon environments, and even there experiences a hiatus in growth during the dry season. As precipitation becomes sparser toward the tropics, the savanna gives way to the steppe, with abundant xerophytic (dry-adapted) and thorny species. Beyond the band of tropical deserts (where the presence of isolated water sources nevertheless allows the existence of typical oases), the steppes reappear, this time as formations that are still dry but in a Mediterranean context (with its typical scrub vegetation of evergreen species such as olive, cypress, etc.).

The temperate zones are generally the home of forest formations, consisting of broadleaf trees or conifers depending

on temperature conditions. Conifers develop predominantly in areas at higher elevations on mountains, or at higher latitudes; the classic Siberian "taiga" is a typical example. In drier interior areas with a continental climate, however, the tendency is for steppes or meadows to develop, merging in some cases into genuine deserts (as in central Asia). Last is the tundra, with its mosses and lichens, that flowers during the brief Arctic summer.

THE HUMAN POPULATION

Proconsul and *Kenyapithecus*, two anthropoid apes who lived in Africa between 23 and 14 million years ago and were characterized respectively by the absence of a tail and an upright posture, are no doubt among the oldest known animal species in some way similar to human primates. Probably descended from them is *Australopithecus africanus*, a hominid with a cranial capacity of about 30 cubic inches [500 cm^3] (a third of our own braincase), whose fossil remains, dating back two to six million years or so, were discovered in southern and eastern Africa. Its slow evolution successively led to *Homo habilis*, *Homo erectus*, and *Homo sapiens*, and culminated about 40,000 years ago in the appearance in the Near East of *Homo sapiens sapiens*, the human species to which we belong.

Historical basins and great stages of the world's population. According to many scholars, therefore, the cradle of humanity was probably eastern Africa. From the area of present-day Tanzania, Kenya, and Ethiopia, where the oldest human fossils have been discovered, the earliest hominids are believed to have spread first to the temperate zones of Eurasia and then, in succession, to the other regions of Europe and Africa, the Americas and Oceania.

The spread of *Homo erectus* and the amazing evolutionary dynamism of the genus *Homo* are described here by Yves Coppens:

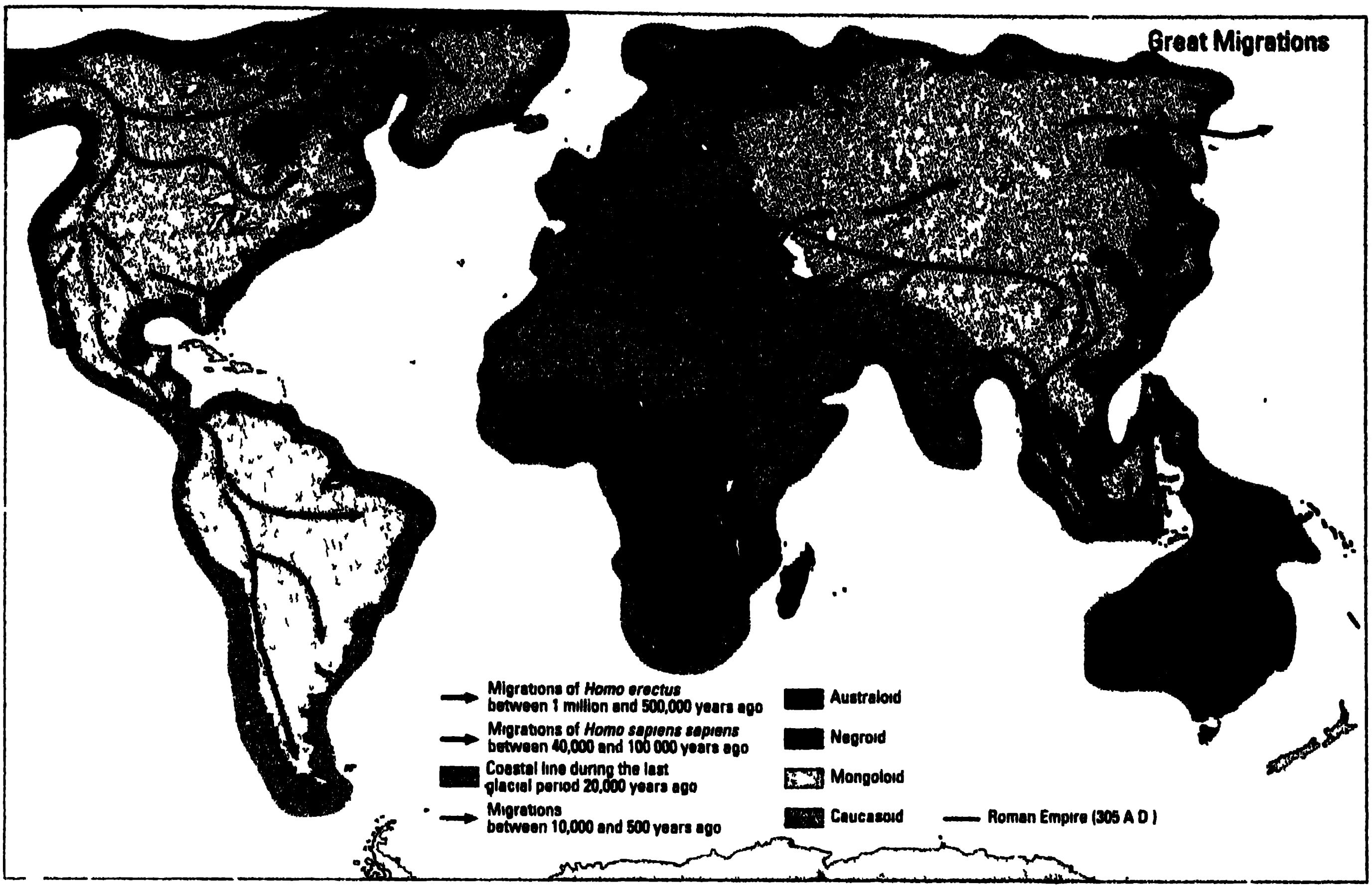
> *The human species was now off to conquer the planet.*
>
> *It was agreed to call this humanoid* Homo erectus. *Indeed,* Homo habilis *had evolved and a taller and heavier humanoid with a low and larger braincase appeared on the scene, its bones thickened and developed superstructures (a sagittal ridge, a supraorbital and an occipital foramen), and it was logical to give it another name. However, as was to be expected, a "species" that covered most of three continents obviously exhibits a much wider range of variations.* Homo erectus *found in China ... is not at all like* Homo erectus *unearthed in Spain or France ...., and the hominid of Tanzania is in no way interchangeable with that of Morocco.... Added to this diversity is another and unexpected one: there is no direct transition from* Homo habilis *to* Homo erectus, *like the passage of* Australopithecus *to* Australopithecus boisei, *but an evolution that has gone through numerous intermediate stages whose characteristics evolved at a different pace.... It would actually seem that the genus* Homo *is an example of continuous evolution. Because the transformation was a gradual one ... and since the intrinsic and essential characteristic of the human species is the development of culture, it is logical to think that the latter was involved in its biological evolution.*

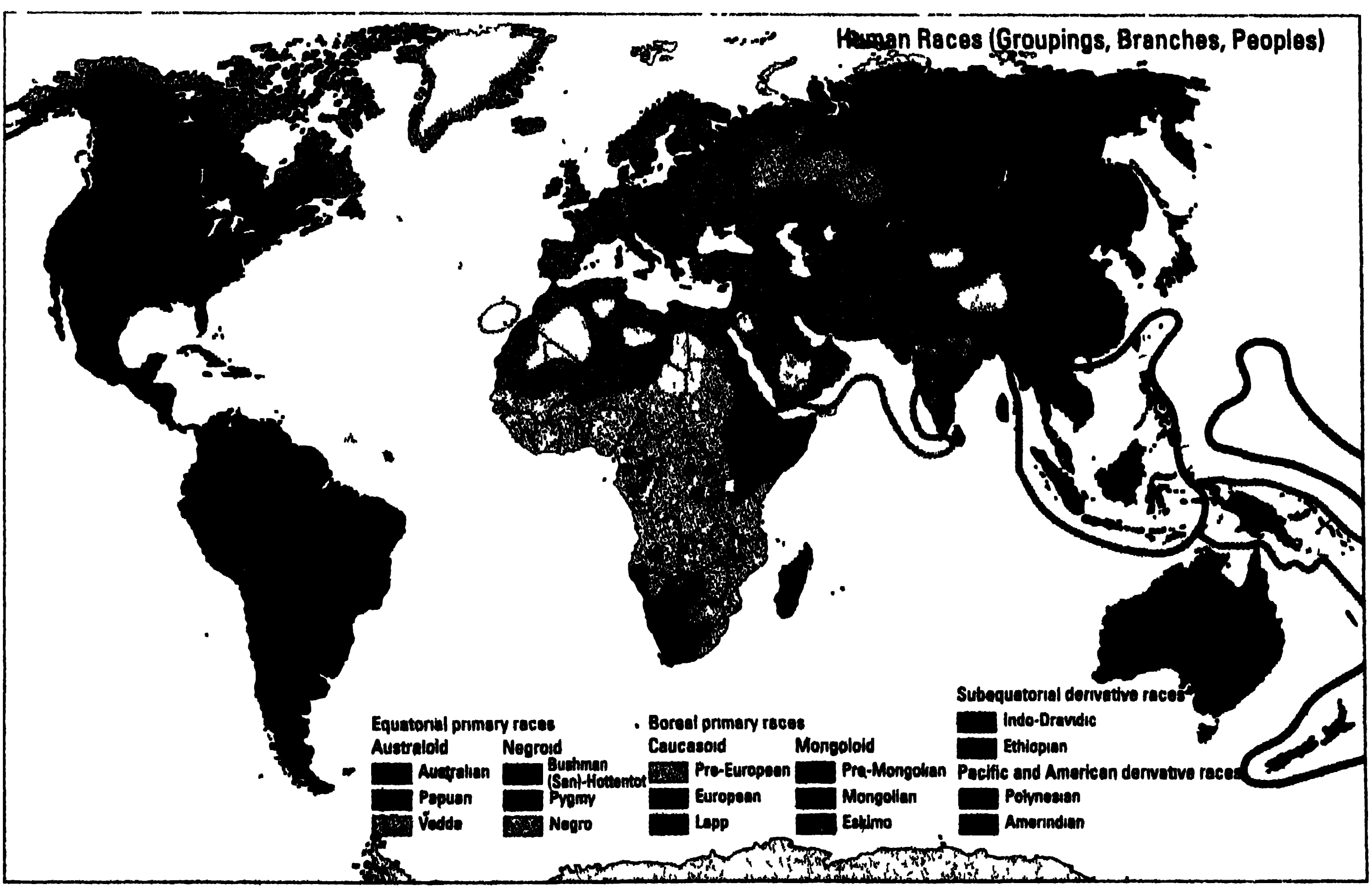
For hundreds of thousands of years our species survived by gathering wild tubers, roots, and fruits, as well as by hunting wild animals with extremely rudimentary weapons. During this first long phase of its existence, the human population of the Earth multiplied slowly, probably totaling no more than 5 million 10,000 years ago. The first major demographic increase occurred with the introduction of agriculture, the oldest evidence of which—in Mesopotamia, India, and southern China—dates back 8000–10,000 years. The agricultural revolution increased the availability of food and facilitated the establishment of village communities, which in turn promoted extensive demographic growth that led to a world population some 4000 years ago of at least 40–50 million people. A further population increase came with the emergence of cities in the great alluvial lowlands of Mesopotamia and Egypt, and later of India and China.

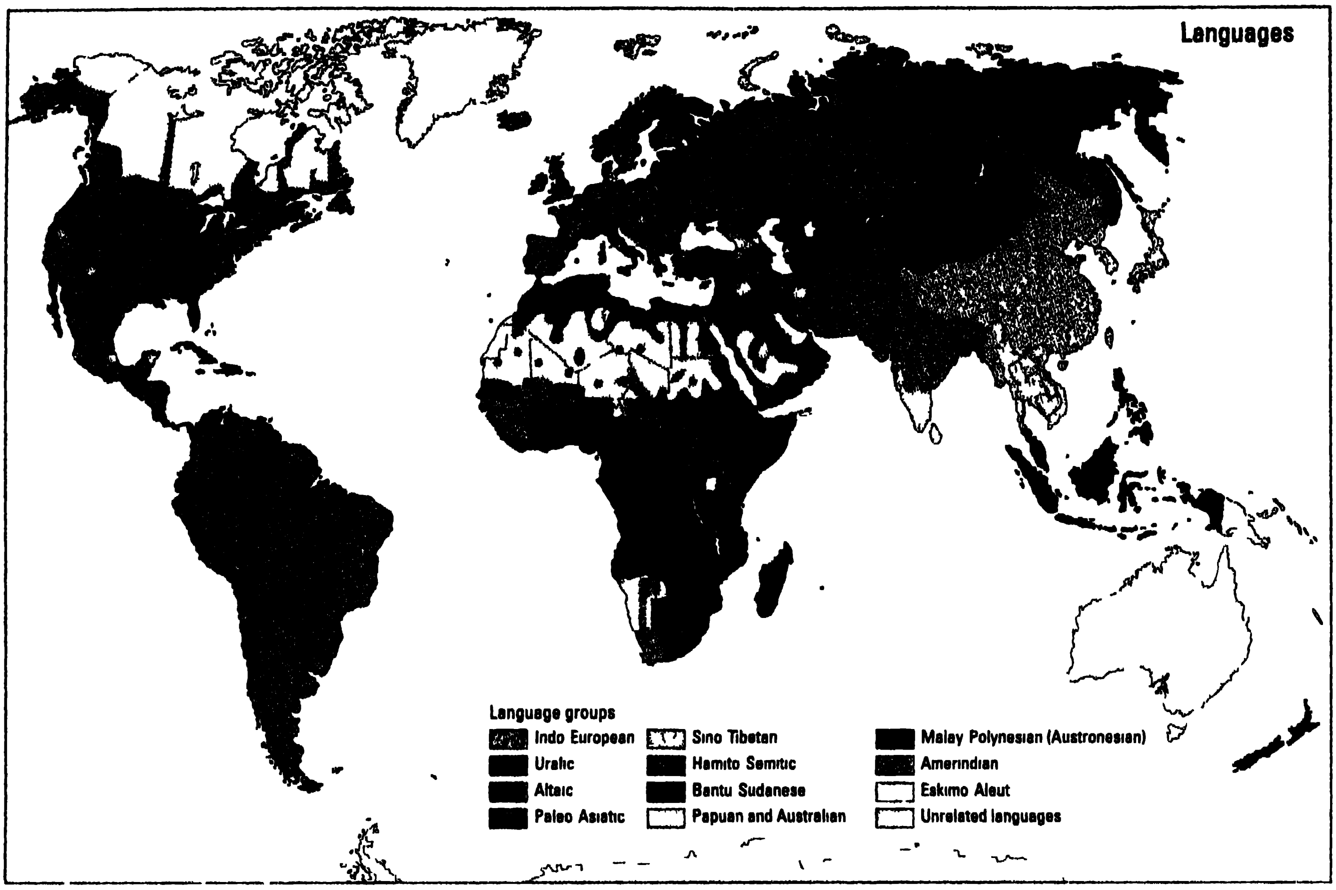
Around the beginning of the Christian era the planet's population of 250 million was basically concentrated around three major geopolitical nuclei: the regions occupied by the Roman, Indian, and Chinese empires. It took another 1600 years for the human population to double to half a billion people. After the end of the 17th century this rate accelerated, and by 1950 the Earth's population had multiplied fivefold, reaching almost 2.5 billion, subsequently doubling again in less than forty years.

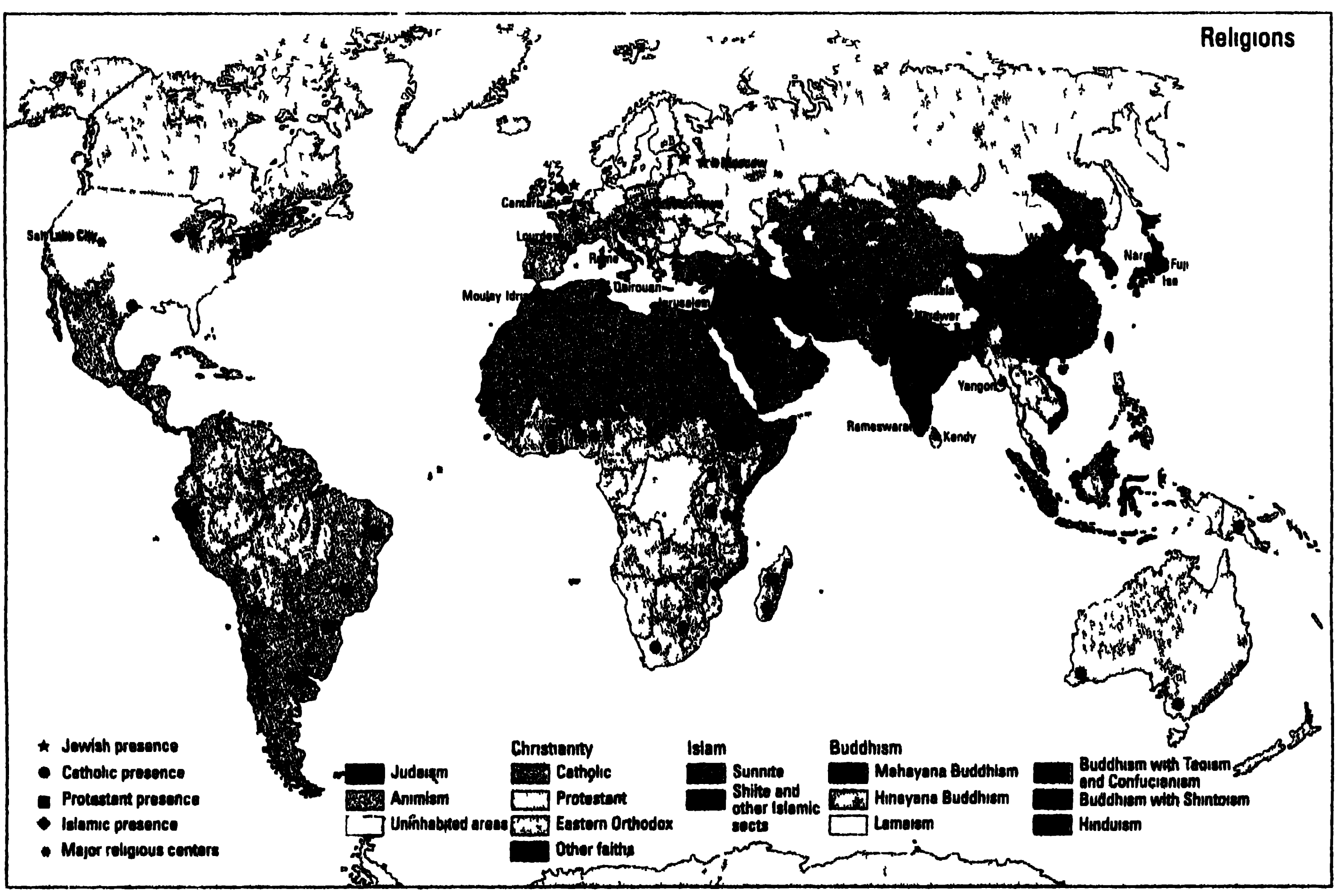
Physical and cultural features. ***Race.*** The various groups of humanity are differentiated by their racial and cultural elements. A human race is understood to be a group of people who have inherited certain specific somatic characteristics in common. Culture, on the other hand, is understood to be the spiritual attributes (like language and religion) and material characteristics (such as predominant occupation, nutrition, type of housing) of a people. It should be pointed out directly that the areas of diffusion of the somatic characteristics do not always coincide with that of the cultural features: it is thus entirely possible that individuals of the same race may speak different languages, or conversely, that groups speaking the same language may belong to different races. This leads to the introduction of the concept of an "ethnic group," the members of which exhibit common cultural characteristics but do not necessarily belong to the same race. In fact, the very concept of "race" has been called into question, especially following the distorted way it has been used during certain periods of history. As it is used here, race refers to elements of somatic differentiation which have nothing to do with inappropriate judgments of cultural worth; hence, race and not racism.

Races are distinguished on the basis of such criteria as, for example, cephalic index (the ratio between the length and the breadth of the cranium), pigmentation (the amount of melanin in the skin, which determines an individual's skin color), facial profile, color and shape of the eyes, hair texture, and so on. Consequently, we distinguish among individuals who are dolicocephalic (having a long head), brachycepahlic (having a short, wide head), or mesocephalic (with a cranial index of intermediate size); among racial populations who are black, yellow, or white (that is to say, whose skin has an abundance, scarcity, or absence of melanin); among people who are prognathous or orthognathous (depending on whether their jaws protrude or not), and so on. On the basis of these and other dif-


Great Migrations
Migrations of *Homo erectus* between 1 million and 500,000 years ago
Migrations of *Homo sapiens sapiens* between 40,000 and 100 000 years ago
Coastal line during the last glacial period 20,000 years ago
Migrations between 10,000 and 500 years ago
Australoid
Negroid
Mongoloid
Caucasoid
Roman Empire (305 A D)


Human Races (Groupings, Branches, Peoples)
Equatorial primary races
Australoid
Australian
Papuan
Vedda
Negroid
Bushman (San)-Hottentot
Pygmy
Negro
Boreal primary races
Caucasoid
Pre-European
European
Lapp
Mongoloid
Pre-Mongolian
Mongolian
Eskimo
Subequatorial derivative races
Indo-Dravidic
Ethiopian
Pacific and American derivative races
Polynesian
Amerindian


Languages
Language groups
Indo European
Uralic
Altaic
Paleo Asiatic
Sino Tibetan
Hamito Semitic
Bantu Sudanese
Papuan and Australian
Malay Polynesian (Austronesian)
Amerindian
Eskimo Aleut
Unrelated languages


Religions
Salt Lake City
Rome
Kandy
Jewish presence
Catholic presence
Protestant presence
Islamic presence
Major religious centers
Judaism
Animism
Uninhabited areas
Christianity
Catholic
Protestant
Eastern Orthodox
Other faiths
Islam
Sunnite
Shiite and other Islamic sects
Buddhism
Mahayana Buddhism
Hinayana Buddhism
Lamaism
Buddhism with Taoism and Confucianism
Buddhism with Shintoism
Hinduism

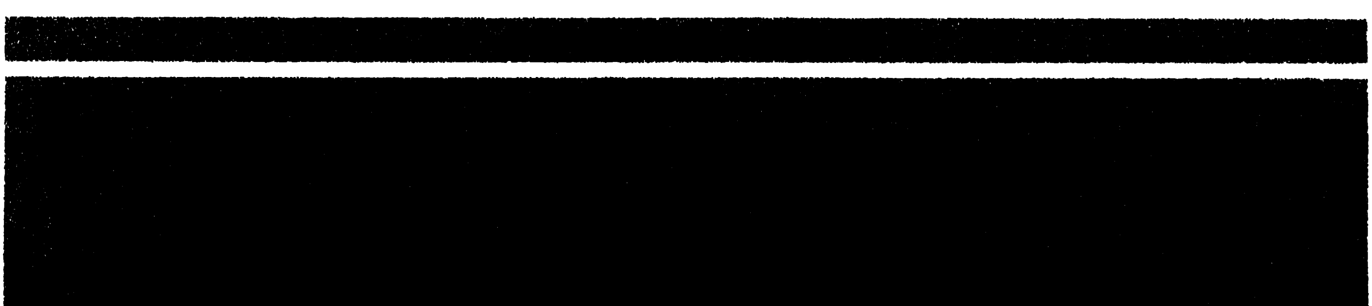
ferences, we can distinguish among roughly 50 races, all traceable to four primary racial divisions: Caucasoid—with more or less light skin, an orthognathous profile, medium height, thin hair, etc.—originally disseminated throughout Europe, Mediterranean Africa, southwest Asia, and India, and subsequently, during the colonial period, the Americas, Australia, and New Zealand; Mongoloid—with a yellowish complexion, relatively short stature, smooth dark hair, and dark slanted eyes—distributed throughout eastern Asia, Indochina, and Indonesia; Negroid—with dark skin, prognathous profile, snub nose, black curly hair, and dark eyes—a people that originated in sub-Saharan Africa and were forcibly transferred to the Americas during the "slave trade"; and Australoid—with brown skin, prognathous profile, prominent forehead, and dark wavy hair, who today have been reduced to small numbers in Australia, New Guinea, Melanesia, and the Deccan. There are also "derivative races," the result of racial mixing or of reproductive isolation in ancient times (as is the case of the Ethiopians, Polynesians, Amerindians, and many others). Today, interbreeding between individuals of diverse races is an increasingly common reality which in some regions of the world contributes to the lessening of racial characteristics that were at one time clearly differentiated.

Language. Among the manifestations of spiritual culture, language occupies a role of particular importance, constituting a phonemic, grammatical, and lexical system which enables members of the same community to communicate among themselves and divides them from others as a unitary ethnic group. Language, moreover, is closely linked to the literature it engenders and, as such, it further cements in those who speak it the awareness of being part of a unit distinct from other groups. Of course, this does not exclude the fact that inhabitants of the same country may sometimes speak different languages, as in the case of Belgium, for example, where the official languages are French (Walloon dialect) and Dutch (Flemish dialect), or Switzerland, where German, French, and Italian are spoken. Furthermore, among ethnic groups speaking the same language, dialectical forms may also be used within circumscribed geographical areas which satisfy daily popular (but usually not literary or technical) aspects of local needs for expression.

The approximately 3000 languages spoken in the world today can be subsumed under several basic linguistic branches (such as the Italic branch, which includes the Romance languages). These in turn, are part of larger language families, among which the major ones are the Indo-European family (including the Italic, Germanic, Slavic, Indo-Iranian, and other branches); the Ural-Altaic family (comprising the Finno-Ugric languages and the Altaic languages of the Turkic and Mongol peoples); the Sino-Tibetan family (including Chinese and several of the Indochinese languages); the Hamito-Semitic or Afro-Asiatic family (consisting of Hebrew, Arabic and other languages of northern Africa); and the Niger-Congo, Nilo-Saharan, and Khoisan families (comprising the tongues spoken in sub-Saharan Africa). Other geographically or numerically less widespread language groups are the Malayo-Polynesian, Australian, Papuan, Amerindian, etc. Migrations as well as the political and economic power of many nations have made some languages more successful than others, replacing the original ones in many regions. We need only think of the spread of English, not to mention that of French, Spanish, and Portuguese throughout colonized areas during previous centuries; at the time of slavery, these languages even gave birth to others called creoles, born of their simplification.

Religion. Despite today's pronounced secularization process observable throughout the world, religion remains a fundamental aspect of the spiritual culture of peoples, with precepts always related to ethical and social behavior as well as to esthetic and hygienic standards. For purposes of systematic classification, the world's religions are usually divided into two major groups: those with a rigorously ethnic perspective that reinforces the cultural homogeneity of a specific people or country, like Hinduism in India or Shintoism in Japan, and those with a universal vocation seeking to proselytize ever larger areas, as do Christianity and Islam. The territorial distribution of the various religions has changed in the course of history through conquests and conversions, with integralism often resulting in mounting intolerance leading to cruel wars.

Most of humanity professes a few great religious faiths, the most widespread being Christianity, with its three major confessions: Roman Catholic, Protestant (including among its many



denominations the Lutheran, Anglican, and Baptist churches), and Eastern Orthodox. Islam also has a large number of faithful followers, divided between the Sunni and Shiite sects, while geographically more circumscribed (and therefore, as has been said, more ethnically based) are Hinduism, Buddhism, Confucianism, and Shintoism. Judaism is the least of the world's major religions in terms of the number of its adherents, who are fairly widely dispersed throughout the world.

The elements of material culture. Among the more revealing aspects of material culture are the prevalent types of occupation, nutrition, housing, and clothing. These elements depend on the lifestyles of the various ethnic groups involved and are greatly influenced by such physical factors as climate.

Ethnolinguistic minorities and sources of conflict. The very elements which distinguish the racial aspects and the spiritual and material cultures in a given geographic area reflect the presence of ethnic minorities which exhibit one or more characteristics that are at variance with those of the majority group, as in the case of citizens who belong to a nationality different from that of the dominant group in a given country or people who speak a language which differs from the official or prevailing language, or also individuals whose religious beliefs diverge from the common religion, etc. Far too often, ethnic majorities and minorities have found it difficult, and at times intolerable, to live together in the same country, with separatist movements instigating violent conflicts. Belgium, Northern Ireland, Corsica, and all of the former Soviet area, in general, not to mention the former Yugoslavia, provide some European examples of regions where sharp internal tensions often linked to claims of autonomy have long been known and have recently flared up, erupting dramatically in clashes and occasionally resulting in national independence.

Human distribution on Earth. By 1990 the world's population totaled over 5.2 billion people, after registering an average annual increase of 1.7%, a birth rate of 27 per 1,000 population, and a mortality rate of 11 per 1,000 population during the previous decade. Humankind is not uniformly distributed over the planet, however; in fact, vast uninhabited areas cover about a fifth of the Earth (such as the Arctic and Antarctic regions, deserts, highest mountain peaks, and rainforests), where no permanent human settlements exist because of the harsh climate and environmental conditions.

Settlement patterns depend on various factors. Some are due to natural elements (climate, water resources, vegetation, soil fertility, etc.), others are biological in nature (endemic diseases, acclimatization, fertility rates, etc.), and still others, finally, are cultural (lifestyle, economic and social organization, age of the settlement, etc.)

Our planet offers limited areas of attraction for population settlements and these are separated from each other by vast stretches of ocean and land devoid of any value for human settlement. Humanity therefore did not spread from a central nucleus like an oil spill, but rather concentrated in some favored regions. The Northern Hemisphere, in particular, encompasses two thirds of the land above sea level and attracted 90% of the human species. In fact, Europe, the United States, Japan, China, and India—namely, some of the world's most populated regions—lie in the temperate belt of the middle latitudes and in the subtropical zone of the Northern Hemisphere.

Some regions of the Earth with large concentrations of people may not have the resources to meet the needs of the population and are therefore deemed to be "overpopulated"; others, however, are considered to be "underpopulated" because they do not have enough people to exploit their resources adequately. What is more, the economic and social organization in some parts of the world are unable to satisfy even the minimal food requirements of the population, resulting in widespread famine, a tragic reality which today still strikes hundreds of millions of people.

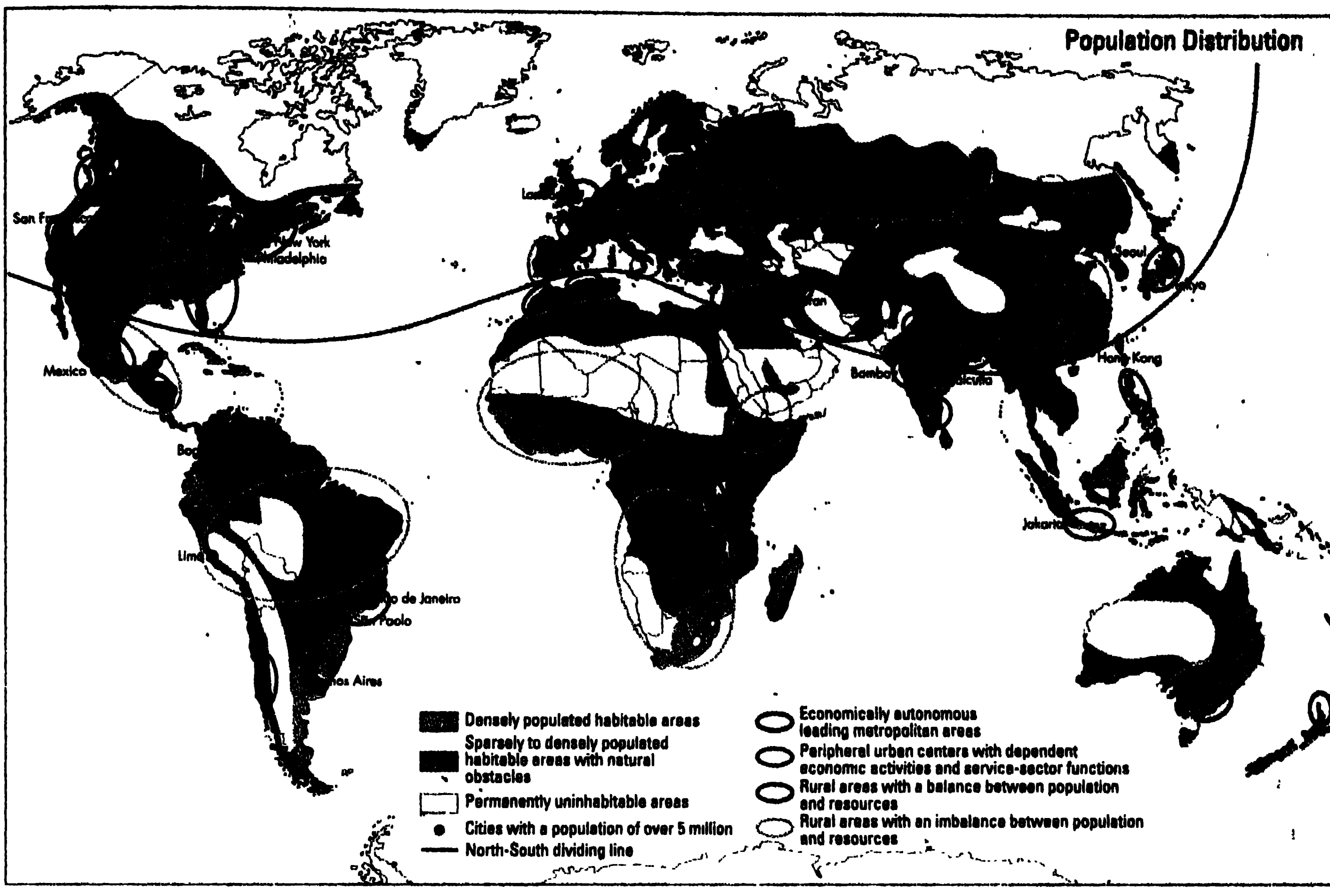
Population density. Considering that the Earth's landmasses cover about 57.5 million mi^2 [149 million km^2], the mean density of the world population is 90 people per mi^2 [35 per km^2], the most densely populated areas being Asia and Europe (with respective densities of 184 and 176 per mi^2 [71 and 68 per km^2]), followed by Africa (52 per mi^2 [20 per km^2]), the Americas (44 per mi^2 [17 per km^2]), and Oceania (7.7 per mi^2 [3 per km^2]).

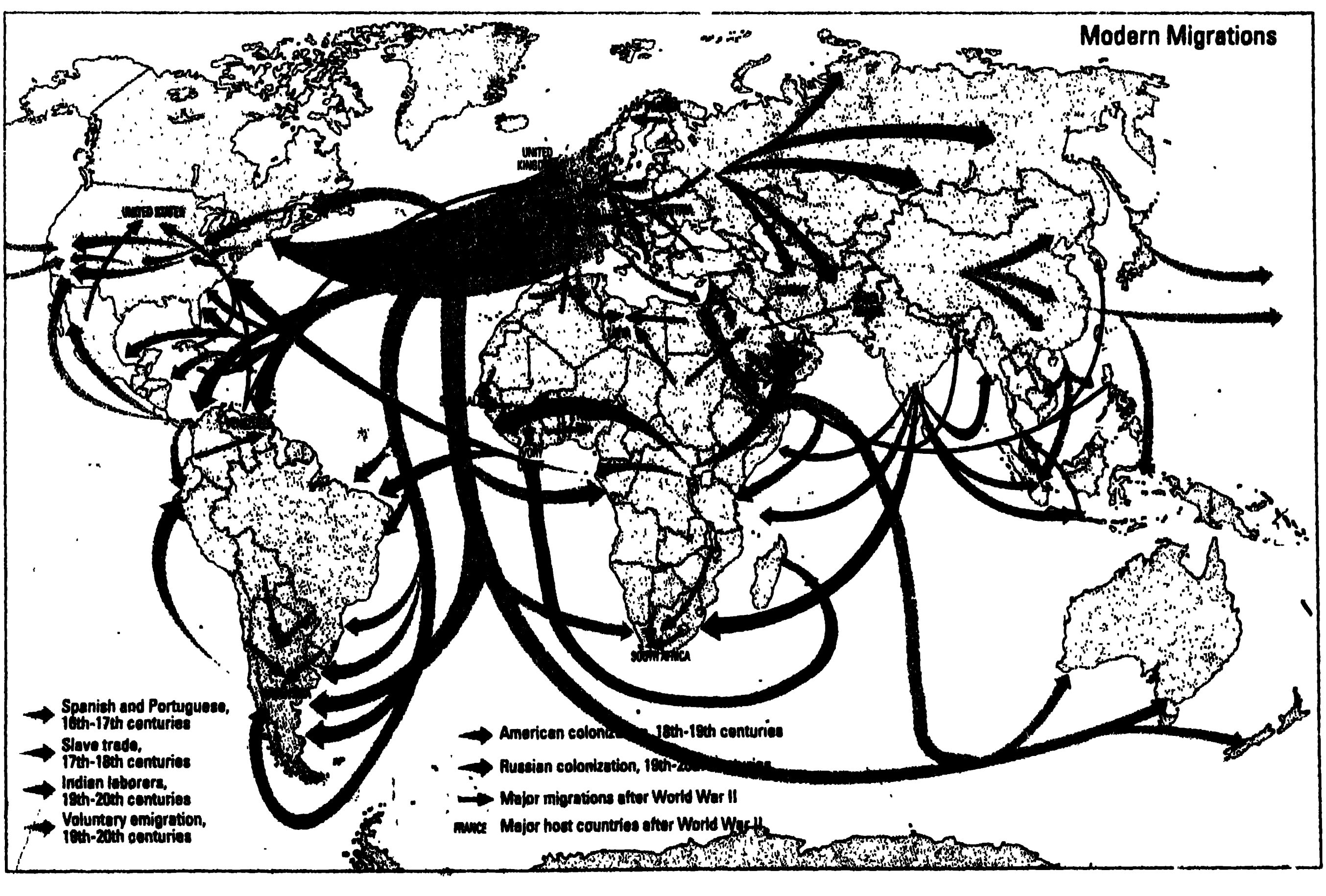
Within each continent, however, population densities may vary widely (for example, the Asian country of Bangladesh had a density of 2255 per mi^2 [870 per km^2]) in 1993. Within the same country there may also be a wide discrepancy in population distribution, as in the case of Egypt, where the overall density is 124 per mi^2 [48 per km^2], but where an overwhelming majority of the people are concentrated along the banks of the Nile, with a density of 2331 per mi^2 [900 per km^2].

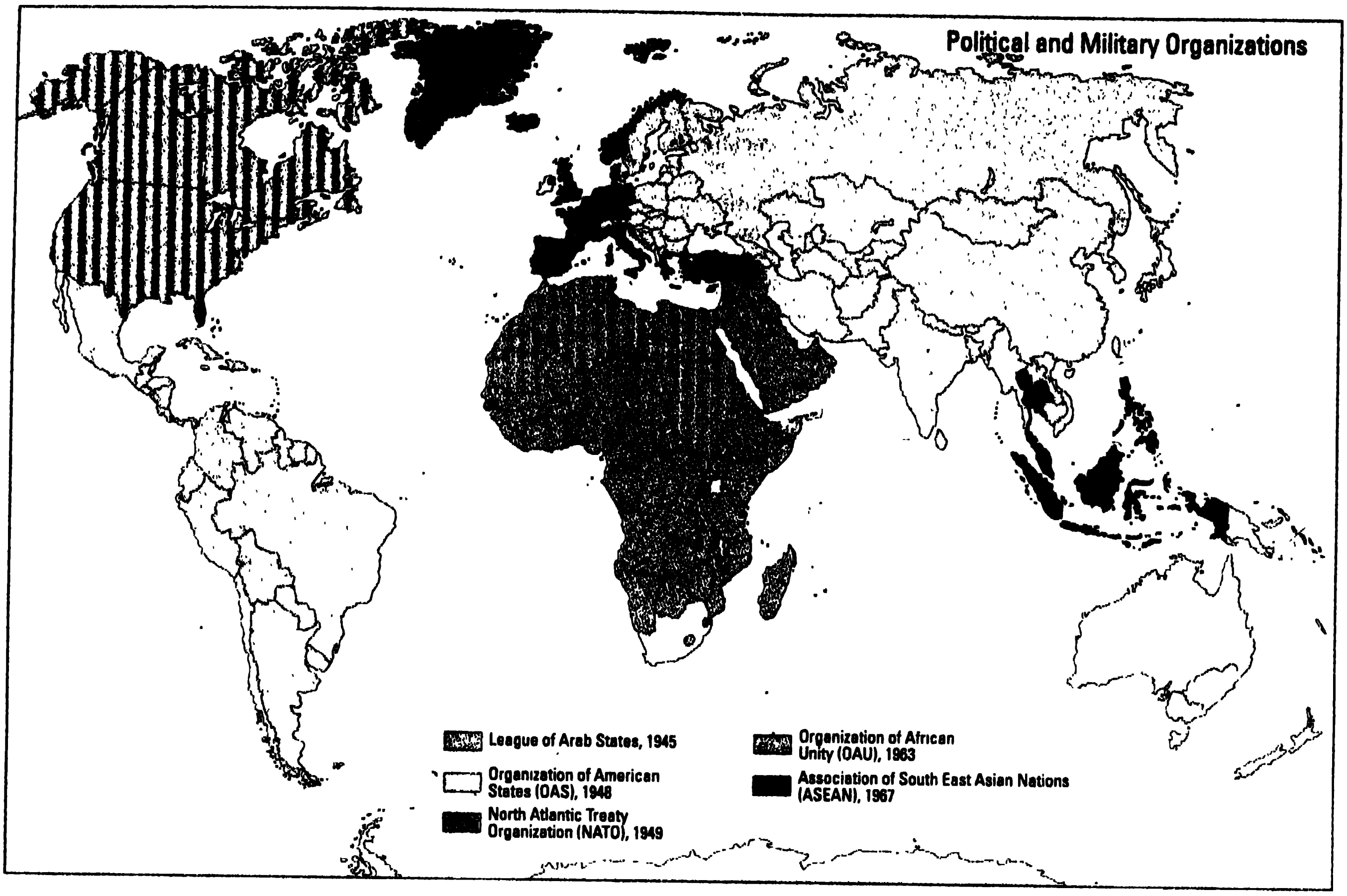
The regions of the world generally regarded as high-density areas are those with more than about 250 people per mi^2 [100 per km^2], while densely populated areas are considered to have 150–250 per mi^2 [50–100 per km^2], and moderate-density areas from 25–150 people per mi^2 [10–50 per km^2]. Areas with less than 25 people per mi^2 [10 per km^2] are regarded as having a low density. Usually, the population density increases as one proceeds from the arid zones to those with at least one rainy season, from the cold to the temperate and tropical areas, from the great forests to those areas with more open vegetation, and from the inland to the coastal regions.

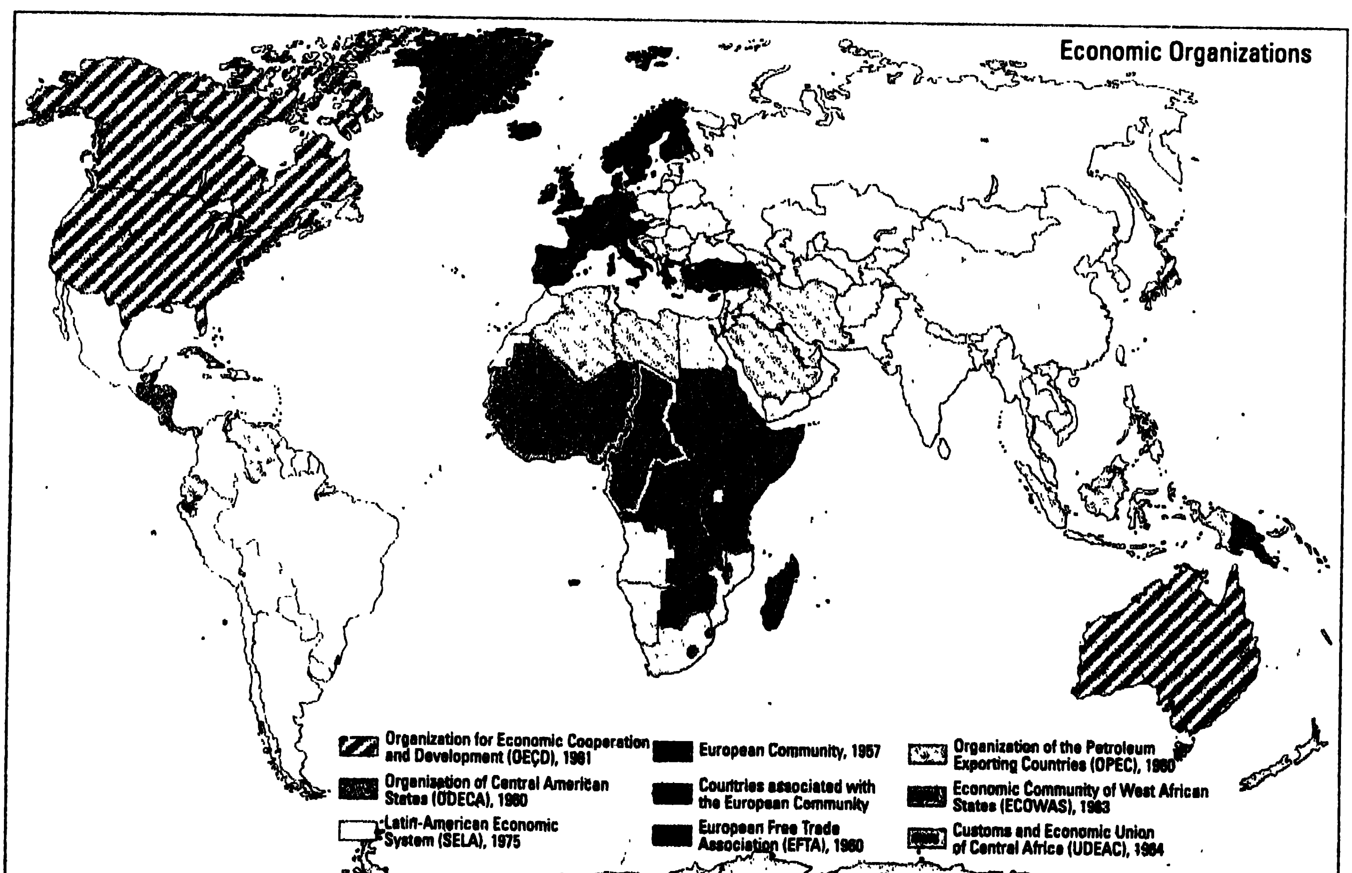
In addition to being influenced by physical environment, population density is also affected by cultural, economic, and social factors. From the very low population density of areas inhabited by peoples who live by hunting and gathering we proceed to the high density of those subject to intensive and irrigated cultivation, and finally to the very high density of settlements which derive their livelihood from an industrial economy. Even in the latter case, however, the data must be interpreted with some caution because, although numerically comparable, there is a profound difference between the high density of a Hindu farming region and that of an English industrial area.

Urban growth. Today's phenomenon of increasing population and its concentration in certain areas is closely linked to urban growth, which especially in the last decades has experienced exceptional development as a result of "urbanization." In many countries of the world, cities have been expanding inordinately, sometimes forced to coalesce with others to form large conurbations. On occasion, these have come to occupy broad areas called "urban regions" or "city regions" (as in the case of the Ruhr valley in Germany). The megalopolis, a huge


Population Distribution
Mexico
Hong Kong
Densely populated habitable areas
Sparsely to densely populated habitable areas with natural obstacles
Permanently uninhabitable areas
Cities with a population of over 5 million
North-South dividing line
Economically autonomous leading metropolitan areas
Peripheral urban centers with dependent economic activities and service-sector functions
Rural areas with a balance between population and resources
Rural areas with an imbalance between population and resources


Modern Migrations
Spanish and Portuguese, 16th-17th centuries
Slave trade, 17th-18th centuries
Indian laborers, 19th-20th centuries
Voluntary emigration, 19th-20th centuries
Major migrations after World War II


Political and Military Organizations
League of Arab States, 1945
Organization of American States (OAS), 1948
North Atlantic Treaty Organization (NATO), 1949
Organization of African Unity (OAU), 1963
Association of South East Asian Nations (ASEAN), 1967


Economic Organizations
Organization for Economic Cooperation and Development (OECD), 1961
Organization of Central American States (ODECA), 1960
Latin-American Economic System (SELA), 1975
European Community, 1957
Countries associated with the European Community
European Free Trade Association (EFTA), 1960
Organization of the Petroleum Exporting Countries (OPEC), 1960
Economic Community of West African States (ECOWAS), 1963
Customs and Economic Union of Central Africa (UDEAC), 1964

urbanized region in which many cities and suburbs are merged with major industrial facilities, has acquired considerable economic importance; the first and best known example is the North Atlantic megalopolis linking Boston, New York, Philadelphia, Baltimore, and Washington in an area which encompasses about 50 million people.

Whereas at the start of the 20th century the world's urban population constituted 14% of the total, it exceeded 40% by the 1980s, a phenomenon which was also hastened by a conspicuous exodus from the countryside and often caused serious economic and social problems in the cities. Today, while urban growth in the industrialized countries has been slowed (with a quite a number of people preferring to abandon the congestion and stressful life of the city), the major metropolitan centers in the developing countries continue to become bloated, leaving crowds of peasants who often fail to find work to overflow into the dilapidated peripheral shantytowns, where they swell the ranks of the unemployed and marginalized.

Natural population dynamics. ***Birth and mortality rates.*** Fundamental in any analysis of natural population dynamics are the concepts of birth and mortality rates. The "natural balance" is the difference between the number of births and the number of deaths affecting a given population in the course of a year: it is positive when the births ("additions") exceed the latter ("reductions") and negative when the opposite is the case; the balance is zero when the two are the same. The birth rate is the ratio between the number of live births and the total population over a given period of time; it can be affected by such environmental factors as climate, resources, occurrence of natural disasters, etc. Conversely, the mortality rate is the ratio between the number of deaths and the total population. Its analysis distinguishes such factors as sex (to determine the variations in male and female mortality), age (to indicate numerical fluctuations in the various age groups), and occupation (to ascertain and evaluate the connection between individual activities and their pertinent labor risks). Also significant is the infant mortality rate, which reveals how many children die before completing their first year of life, likewise in relation to the total population; this rate is higher in underdeveloped societies. The ratio between the birth and mortality rates indicates the "mean life span" of a given population which, in turn, is linked to its "life expectancy," namely, the probable number of years an individual born in a given year and country will live.

The concept of "demographic transition" and the "baby boom." The concept of "demographic transition" indicates population growth that is due to an increase in births and/or decrease in deaths. The West experienced this phase especially in the early 18th century when scientific and particularly medical discoveries, coupled with improvements in hygienic and sanitary conditions, prompted a sharp drop in the death rate, above all in infant mortality. New demands and new lifestyles, however, have prompted a drop in the birth rate, resulting in a numerically more stable and progressively older population because of its increased average life span. The developing countries are currently experiencing a historic process of "demographic transition" due to a drastic drop in the mortality rate (as a result of the medical measures "imported" from the West) and a persistently high birth rate associated with rural and patriarchal living conditions and attitudes. A United Nations study has projected that the demographic transition in these countries will end around the year 2050 when they, too, will follow a parallel course between the birth and mortality rate levels.

The natural population movement may also experience brief periods when the number of births or deaths flares up due to special circumstances. One such example is what has come to be called the "baby boom," which affected many industrialized nations during the decade following World War II as a result of social and cultural factors associated with that particular historical period; moreover, this phenomenon of "euphoria" typical of the postwar years was influenced by a positive economic outlook. After the second half of the 1950s the "baby boom" gradually abated and was soon replaced by the opposite trend.

Differences in demographic dynamics between North and South. Between 1965 and 1975 the industrialized nations experienced a veritable collapse in the birth rate, and in many of them the "fertility level" dropped below the "replacement level" of two children per woman. Sweden was the first country in the world to reach this so-called "zero growth" rate in 1968, Italy in 1976. Among the factors underlying this development are the tendency to marry at a later age, increased aspirations for a better quality of life, the decision to delay the first pregnancy, and the dissemination of more effective birth-control measures. Coupled with the aging of the general population (with the number of young people declining and those over 70 expanding), this development has, in turn, generated complex social, cultural, political, and economic repercussions, such as a reversal of the trend in international migrations—no longer from Europe to the New World, but from the developing to the industrialized countries—and the fear that the labor force of the future will not be large enough to satisfy economic necessities or that it may no longer be possible to achieve the financial base required to subsidize social, educational, and welfare services, as well as the growing number of elderly and the need to establish adequate structures to meet their requirements—to mention only some of the problems.

The South, on the other hand, is undergoing a kind of "demographic explosion" which dramatically aggravates the problem of overpopulation due to an excess number of people in a country in terms of its natural resources and available technological capacity of the community. The inhabitants of the developing countries are thus destined to contribute in ever greater proportion to the future increase of the world's population (far from insignificant is the fact that today almost 40% of the people in these countries are under 15 years of age). The World Bank projects that by the year 2050 the Earth's population will reach some 10 billion people, 85% of them living in the developing countries, the population of which will have increased from the current 5 billion to 8.4 billion (as contrasted with the far smaller increase from 1.2 to 1.4 billion by 2050 in the industrialized countries). We should bear in mind that these projections are based on present-day conditions and may be partly revised as a result of government intervention, such as the campaign recently launched in France to increase the birth rate there and the successful campaign by the Chinese authorities to contain it in their country.

Migration movements. The number of inhabitants of a country and their national distribution are also affected by population migrations. Although various causes have influenced these migration movements in the past, they can initially be classified according to three characteristics: size, motive, and duration.

In terms of size, a further distinction can be made between "mass migrations" and "migration by infiltration"—the former referring to the movement of entire populations, whereas the latter involves smaller groups or even only single individuals. Both result in ethnic intermixing, with significant consequences affecting customs, language, religion, and the like.

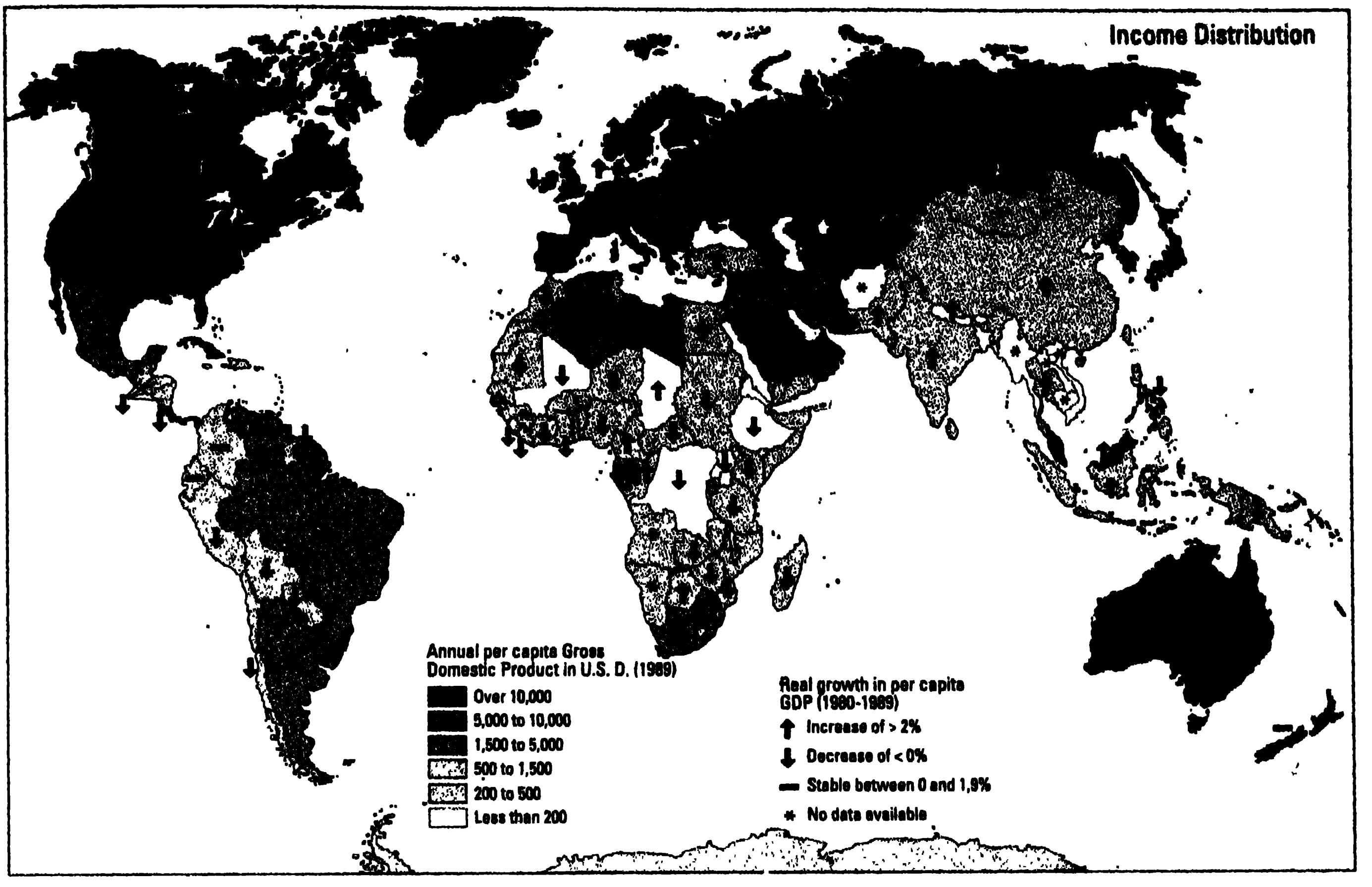
Motives which induce people to migrate include those which lead to "spontaneous" migrations, usually prompted by economic and social reasons, sometimes by the migrant's desire to improve his or her living conditions; "organized" or "guided" migrations, often supported by government aid or state subsidies and designed to achieve a better organization or balance of the national territory by, for example, moving groups of families from depressed or high-density areas to others undergoing development; "coerced" or "forced" migrations, as dramatically exemplified by the slave trade, which transported millions of Africans to work on the American plantations especially during the 18th century.

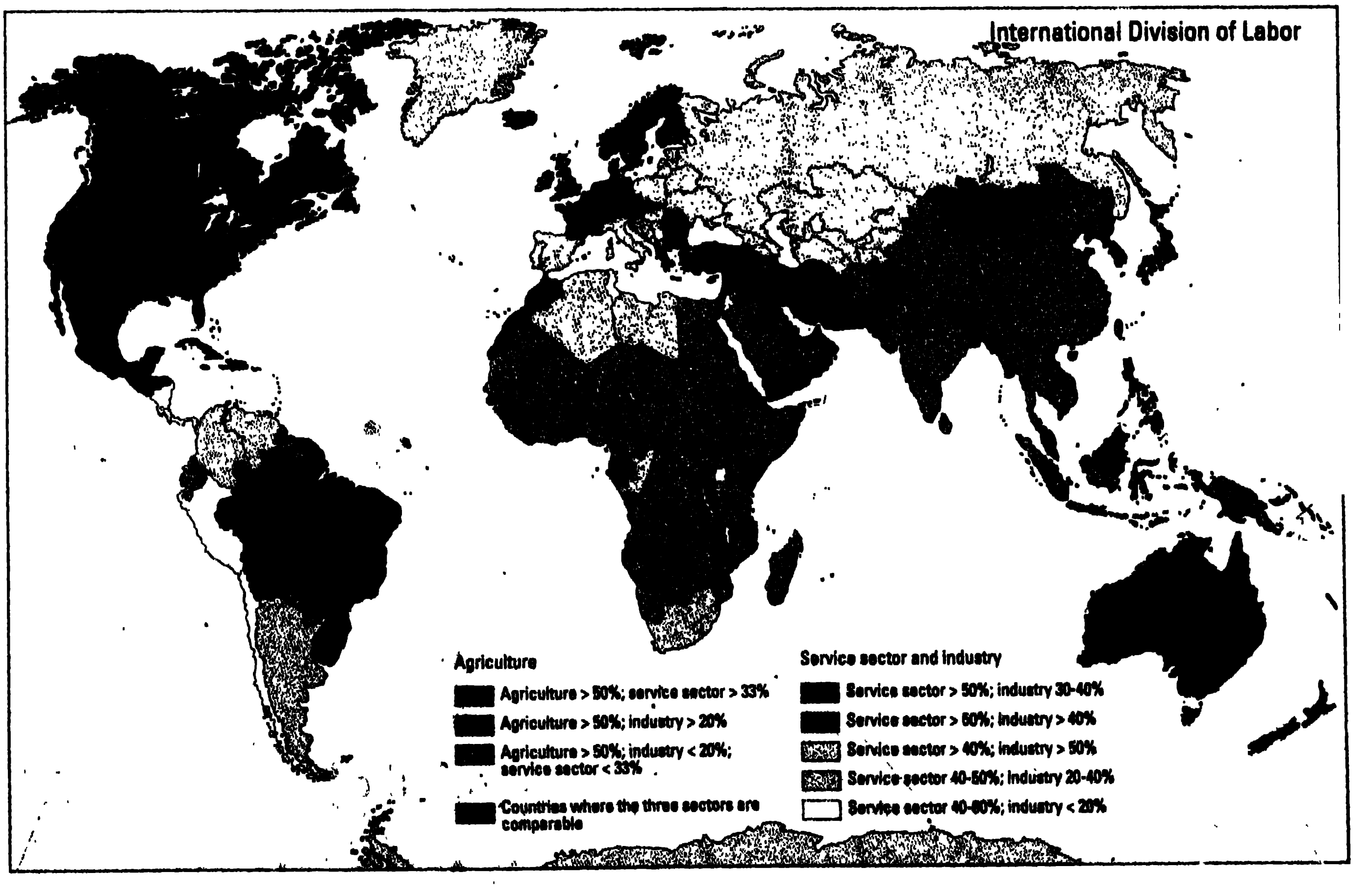
Finally, in terms of duration, migrations can be characterized as "permanent" when the residence transfer is for an indefinite period, "temporary" when it lasts for a varying period of time and implies a return home (as in the case of seasonal nomads engaged in transhumance herding), and as "commuter" migration when those involved leave their homes only during the day, to work or study elsewhere, and return in the evening; included in this latter category are the "border commuters," who live in border areas and work on the other side of the frontier.

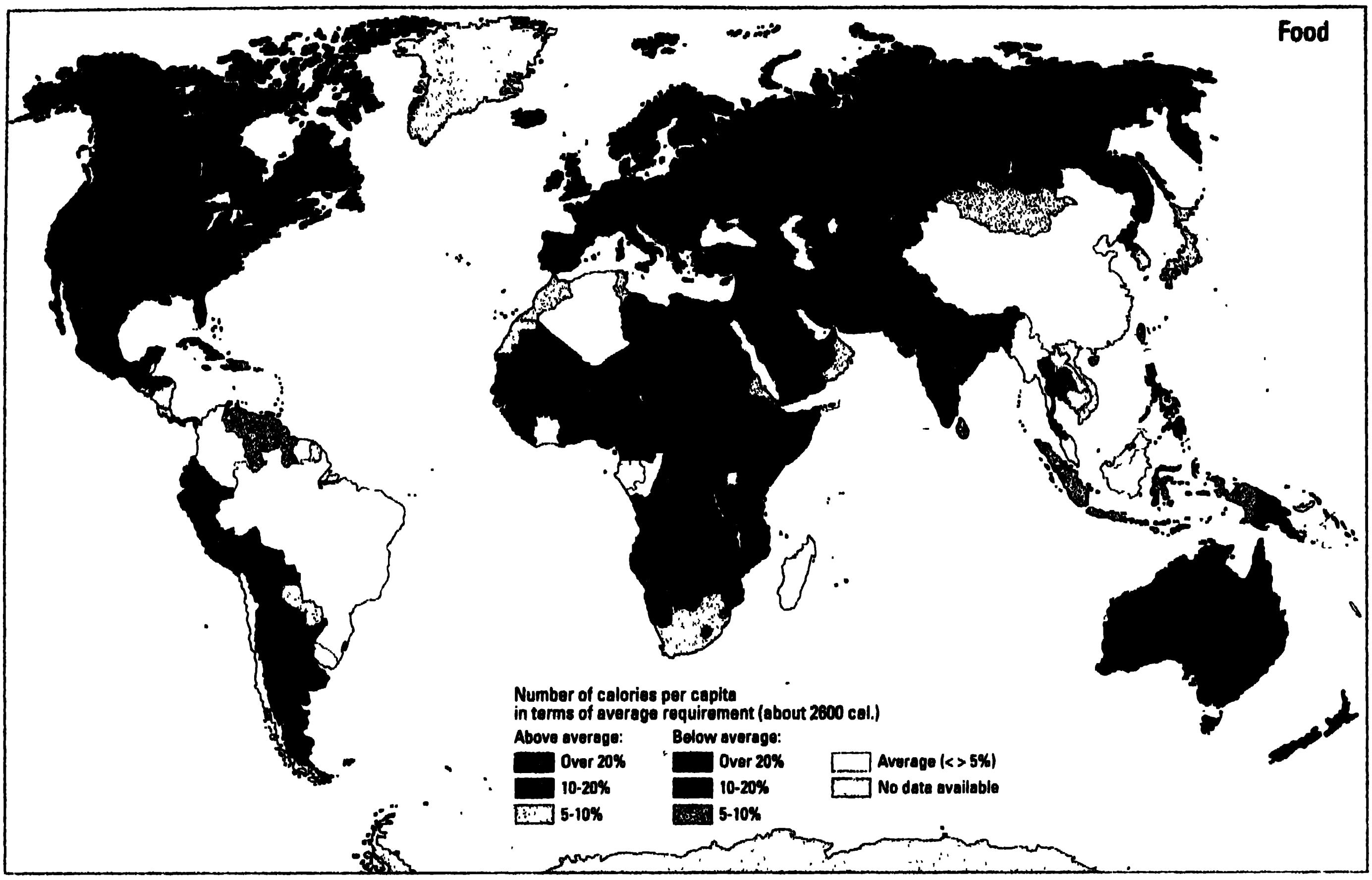
Among the major migrations of the recent past on our planet, the one of paramount significance was surely that which brought a great number of Europeans to the New World during the past two centuries. Between 1800 and 1930 some 40 million people left the European continent permanently for the Americas, impelled by the desire to leave behind trying social, political, and economic conditions to find stable and remunerative work. These emigrants came in successive waves of ethnic groups. Initially, North America attracted primarily Anglo-Saxon settlers, while Spanish and Portuguese emigrants came to South America. They were followed by many Germans and Scandinavians who, in turn, were succeeded at the end of the 19th century by increasing numbers of emigrants from the Mediterranean and eastern Europe: Italians, Greeks, and subjects of the Austro-Hungarian Empire. It has been estimated that about 28 million people emigrated to the United States between 1861 and 1920. Emigration waves have not been constant, however, either in time or size, nor with regard to their composition or direction. The example of Italy is a case in point: until the 1970s it was a country of emigration (both internal and international), but for some time now it has become a goal for immigrants, with a substantial number of them (estimated at between 500,000 and over one million) originating outside the EC, coming from Africa, South America, and Asia—often finding work in marginal and precarious occupations. Today, as in the past, the problems associated with migration have retained some of their basic characteristics. The goal is not to provoke—or at least to limit—imbalances in the population structure of the country of emigration as well as in the host country by preventing social tensions and marginalization, promoting the processes of integration and solidarity, and turning to best account the potential "human capital" inherent in the different ethnic, cultural, and religious differences. In the words of Aristide R. Zolberg:

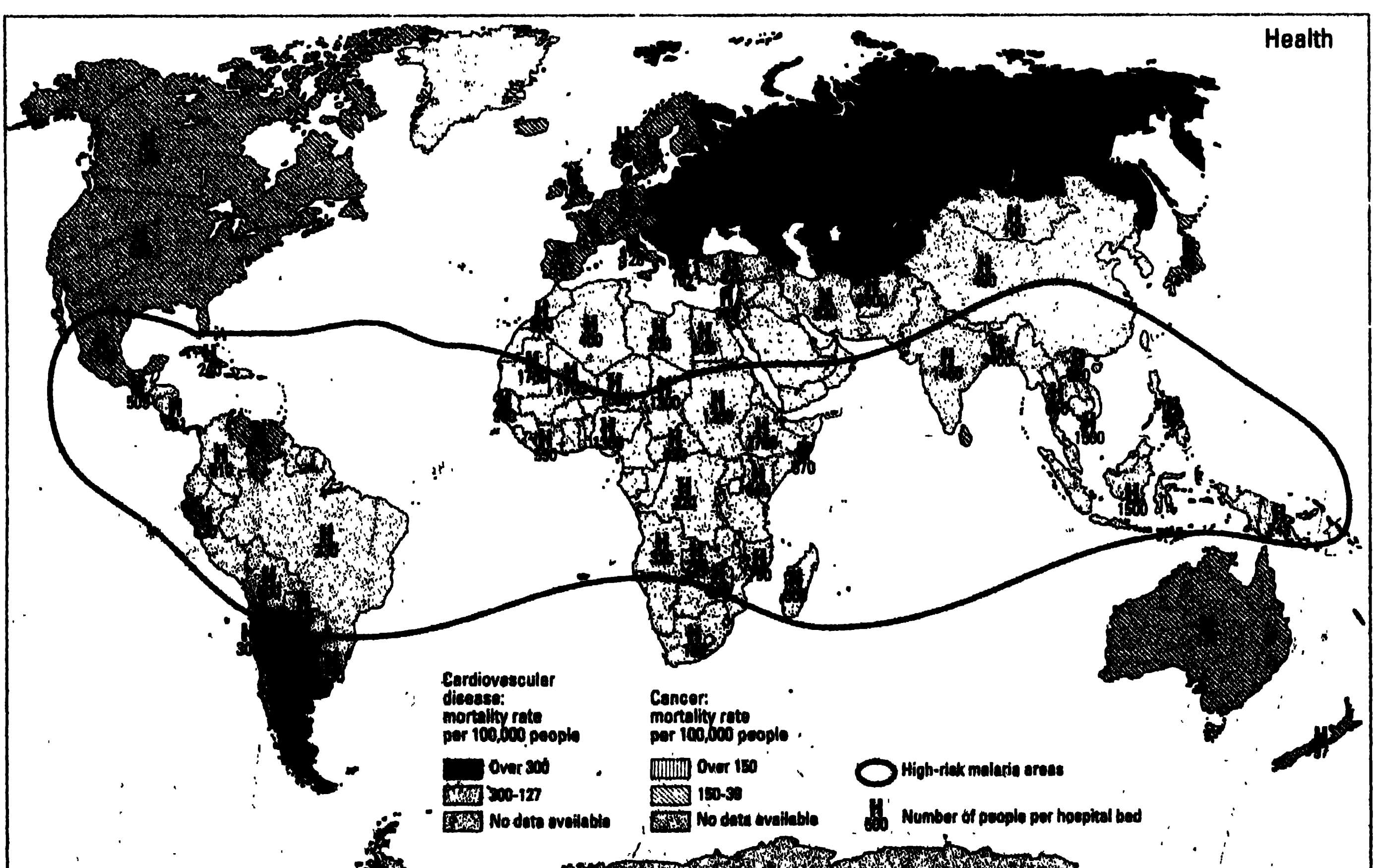
> *The dynamics which have driven population movements to the center of humanistic and political concern during the past quarter century will probably be amplified in the next. Given the persistent inequalities in the conditions prevailing between the rich and poor countries, the number of potential participants in the flow of migration will continue to increase, and because the rich countries have erected a collective wall of protection around them, we must anticipate an increase in North–South tensions with regard to migration which will lead to demands for the inclusion of more equitable agreements within the framework of the "new world order." In the meantime, liberalization in the socialist countries will also present a dilemma to the capitalist democracies. And yet, despite its importance, the subject of international migration has attracted relatively little attention as a subject for ethical reflection.*

International organizations. There are large international organizations throughout the world today whose objective is to seek a peaceful resolution of conflict between countries and to promote various opportunities for collaboration between their member states. The most important and best known is the United Nations (UN), with headquarters in New York at the United Nations Building, which was established by the San Francisco Charter in June of 1945. It is universal in character and, in principle, is open to all nations. Its objective is to maintain international peace and security as well as to promote international cooperation in economic, social, and cultural affairs. Today the UN, which encompasses almost all of the world's countries, is structured into six principal organs: the General Assembly, the Security Council, the Economic and Social Council, the Trusteeship Council, the International Court of Justice, and the Secretariat. The work of the United Nations is supported by and integrated into a number of affiliated agencies: the International Labour Organization (ILO), headquartered in Geneva and designed to foster greater social justice in labor legislation; the Food and Agriculture Organization (FAO), headquartered in Rome, where the seat of the International Fund for Agricultural Development (IFAD) is also located; the United Nations Educational, Scientific and Cultural Organization (UNESCO), headquartered in Paris; the World Health Organization (WHO), headquartered in Geneva; the International Monetary Fund (IMF), headquartered in Washington, D.C., where the International Bank for Reconstruction and Development (IBRD), known as the World Bank, is also located; and the United National Industrial Development Organization (UNIDO), with headquarters in Vienna. Also affiliated with the UN are agencies that promote and coordinate international collaboration in the fields of postal services (UPU), telecommunications (ITU), civil aviation (ICAO), meteorology (OMM), maritime activities (IMCO),


Income Distribution
Annual per capita Gross Domestic Product in U.S. D. (1989)
Over 10,000
5,000 to 10,000
1,500 to 5,000
500 to 1,500
200 to 500
Less than 200
Real growth in per capita GDP (1980-1989)
Increase of > 2%
Decrease of < 0%
Stable between 0 and 1,9%
No data available


International Division of Labor
Agriculture
Agriculture > 50%; service sector > 33%
Agriculture > 50%; industry > 20%
Agriculture > 50%; industry < 20%; service sector < 33%
Countries where the three sectors are comparable
Service sector and industry
Service sector > 50%; industry 30-40%
Service sector > 60%; industry > 40%
Service sector > 40%; industry > 50%
Service sector 40-50%; industry 20-40%
Service sector 40-60%; industry < 20%


Food
Number of calories per capita
in terms of average requirement (about 2600 cal.)
Above average:
Over 20%
10-20%
5-10%
Below average:
Over 20%
10-20%
5-10%
Average (< > 5%)
No data available


Health
Cardiovascular disease:
mortality rate
per 100,000 people
Over 300
300-127
No data available
Cancer:
mortality rate
per 100,000 people
Over 150
150-30
No data available
High-risk malaria areas
Number of people per hospital bed

commercial agreements (GATT), and the peaceful uses of atomic energy (IAEA). Another auxiliary agency operating under UN auspices is the United Nations International Children's Emergency Fund (UNICEF), founded in 1946, headquartered in New York.

In addition to the above world organizations, we should mention other partly supranational organizations of a political-economic or military nature, such as the European Community (EC), North Atlantic Treaty Organization (NATO), Arab League, Colombo Plan for Cooperative Economic Development in South and Southeast Asia, and the Organization of African Unity (OAU). After undergoing extensive revision and review, the Warsaw Pact and COMECON created in eastern Europe after World War II to counteract similar military and economic organizations established in the West have been dissolved following recent political events.

Center and periphery—North and South. ***The concept of center and periphery on a world scale.*** A geographic concept often invoked these days relates to the center and its periphery. A city can be seen as a kind of "motor" (or center) which dominates the outlying surrounding area (or periphery). This same model can be adapted to various levels: an economically advanced region, for example, can be the center of a larger area which it dominates, and a country that is especially highly developed economically can, in turn, be the center of an even larger area. Scholars generally think along the lines of the city and its hinterland, the region, the nation, the "extended space" covering a supranational territory, and the world.

Paralleling the concept of "center and periphery" is that of "sociospatial class." In practice, a homogeneous social group living in a given space constitutes a sociospatial class. The dominant sociospatial class in a given city is, of course, also the leading protagonist in the organization of the territory that is supported by that city. Similarly, the sociospatial class which dominates a particular country will also play a dominant role in the organization of that part of the world which gravitates around that country. It is clear at this point that the center is identified with the dominant sociospatial class, whereas the surrounding area or periphery is identified with the dominated class. In modern history, Western Europe—and Great Britain, in particular—emerged as the first great economic center on a world scale, a position notably consolidated by the Industrial Revolution. Toward the end of the 19th century, the United States also asserted itself as one of the major economic systems of the planet and in the 20th century two other countries—the Soviet Union and Japan—established themselves as dominant in the world economy. Although other countries have also reached a high standard of living, they are usually not regarded as major centers; this is the case of Australia, whose small population and economic system specializing in limited sectors do not allow for an economic development of world significance.

Involved in the "center–periphery" and "sociospatial class" models on a world scale are the issues of development and underdevelopment: the developed countries constitute the "center" and those dependent on them the "periphery." Two contradictory theories exist with regard to the relations between them: some scholars maintain that the development of the richer countries has also benefited the poorer ones, whereas others affirm that the economically more advanced nations have derived an unequal share of the benefits of world progress, thereby causing, increasing or, at the very least, maintaining the poverty of the less developed countries and their sociospatial classes.

Developmental indicators and the concept of "quality of life." The degree of economic and social development achieved by a country and the attendant level of the quality of life of its people are determined by specific statistical indicators, such as, for example, its overall and per capita gross national product, occupational structure of its economically active population, national and per capita consumption of energy, percentage of the urban population compared to the total population, economic and social infrastructures (number of hospital beds, cars, telephones, etc.), number of available calories per capita, infant mortality rate, life expectancy at birth, and so on.

It should be borne in mind, however, that these indicators, especially if considered individually, do not always fully reflect all aspects of reality. First of all, they provide no qualitative indications: a hospital bed in the Third World, for example, may not be accompanied by the same health-care facilities that are available in developed countries. Moreover, these data cannot evaluate precisely how much of the national production is intended for domestic consumption (a factor which in many poor countries is extremely important to the very survival of the population). And finally, calculating the gross national product in U.S. dollars does not take into account the differences in purchasing power of the same income in countries which have reached different stages of development (the quantity of food that US$50, for example, will buy in the United States is obviously quite different from what it will buy in Laos). Nonetheless, developmental indicators will provide a variegated and, on the whole, truthful picture of the quality of life in each country and also permit significant comparisons.

Developed and underdeveloped countries. The various countries of the world are often grouped in two large blocs: the developed and the underdeveloped, or—as they are called today—developing countries. The first includes the industrialized areas with a high standard of living, such as Europe, North America, Japan, and Australia. The second includes the poorer nations, which are often characterized by economic stagnation and high population growth as, for example, the countries of sub-Saharan Africa, Indochina, and some regions of Central and South America. Intermediate between them are some recently industrialized countries whose development is primarily based on exports of mineral resources (especially petroleum) and foreign investments, as is the case of certain Asian, northern African, and Latin American countries.

The developed nations, with a combined population of about 30 percent of the world's total, have absolute dominance over all economic sectors and, in various instances, are able to monopolize and steer the international market along the lines of their own interests. There is a huge income gap between the richest and poorest areas of our planet: the gross national product of the United States, Japan, and western Europe, for example, exceeds by more than one hundred times that of

Bangladesh or the Sahel countries.

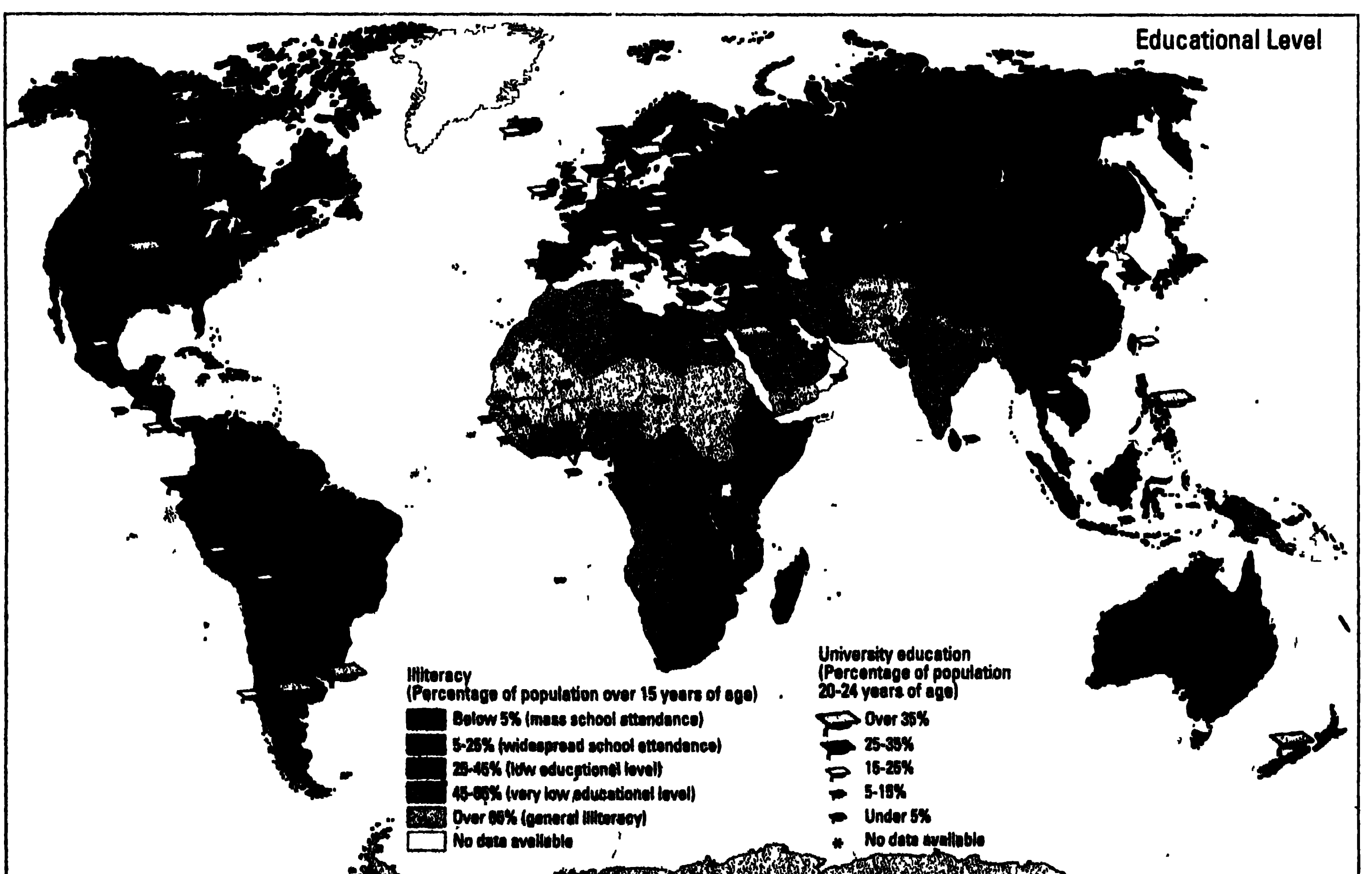
Passage from the underdeveloped to the developed stage is difficult and generally requires a series of transitions which, although not necessarily mandatory, are in theory indicative of the traditional steps required: starting from what is termed the "incipient preindustrial" stage, which is characterized by agriculture, a developing country will progress to the "mature preindustrial" or "incipient industrial" stage, with the gradual establishment of manufacturing, a middle class, and at least one major regional industrial center. This leads to the phase of "industrial maturity" marked by a "full-blown industry" and a "postindustrial" stage through which the leading sector of the economy gradually shifts to the "service sector" with the development of advanced services. It is theoretically in this phase, which today characterizes the most advanced countries, that well-being is highest, regional imbalances inconspicuous, and the middle class is the largest. At this stage, the original industrial center has been replaced by an urbanized region where population, economic activity, and decision-making power are concentrated.

What definition to adopt? Today there are various ways and terms to distinguish the economically richest nations from the disadvantaged ones. One of the most common expressions used to categorize the poor countries of our planet is the "Third World," an expression derived from a concept, today superseded, which distinguished the areas of the world with a low standard of living and a weak economic structure from the "First" and "Second" worlds representing, respectively, the capitalist countries with a market economy and the communist and formerly communist countries with a planned economy. A further distinction, the "Fourth World," is used to designate forty or so countries which are not only tragically poor but also deprived of any potential for development (because of the absence of exportable land or subsoil resources).

Some social scientists speak of "underdeveloped countries," a formulation others reject as negative because it gives the appearance of being racist or potentially racist. They prefer the term "developing countries," but even this definition does not convince everyone because it does not reflect reality and, on the whole, offers a simplistic or overoptimistic vision.

Recently, a new expression has gained currency, which distinguishes the "North" of the world from the "South." According to this dichotomy, the "North" includes the industrialized nations of the temperate zone, regardless of their type of economy (capitalist or communist), specifically, Europe, North America, and Japan. The "South," on the other hand, designates the intertropical countries and those situated in the Southern Hemisphere which are not yet industrialized—in short, that vast part of the world plagued by a low or very low standard of living and tormented by the specter of famine. (It should be mentioned here that several countries geographically located in the South of our planet—such as Australia, New Zealand, and South Africa—in fact belong to the North economically.)

The various realities of development. Today, humanity is passing through a delicate phase of its existence. On the one hand, it is undeniable that several countries have in certain respects experienced improvements in their average standard



of living—although in widely varying degree, depending on the geographic area considered—as compared to the previous century; on the other hand, we must admit that even where there has been real and substantial progress it has often caused various kinds of imbalance, at times of considerable gravity.

Specifically, the industrial and postindustrial periods have been characterized by a number of social problems. The migration of large masses of farmers from the countryside to the cities, for example, has undermined a world founded on solid traditions, often creating critical tensions and marginalization in the urban areas. Intensification of the very mechanization and automation of production processes has led to a loss of jobs (without a concomitant absorption of discharged workers by the service sector), which in some cases has exacerbated existing imbalances. Moreover, a given type of economy and lifestyle engendered by especially rapid and "aggressive" growth has increasingly penalized the traditions of cooperation rather than competition among individuals and groups. Exemplifying these developments is the case of the United States which, although it is the richest country in the world, is witnessing the coexistence of two dramatically antithetical realities: a prosperous and wealthy nation living alongside another that is extremely poor and rent by social conflict (we need only remember that over 30 million people in the U.S. live below the poverty level).

Among the serious problems we face today are the sometimes indiscriminate consumption of our nonrenewable natural resources and the various forms of atmospheric, water, and noise pollution, although we must recognize that humankind is becoming increasingly aware of the risks that such behavior can cause. Notwithstanding the persistence of obvious cases of environmental destruction (one glaring example is the progressive devastation of the Amazon rainforest), technological progress itself is being enlisted to constantly reduce pollution by decreasing pollution levels in the areas most at risk, creating alternate sources of energy, and recycling used resources, among other measures. Only thus can development really coincide with effective and global human growth, based on respect of the environment and a realistic and intelligent interaction with it.

Aspects and causes of underdevelopment. As mentioned, underdevelopment reflects a low or substandard degree of economic growth in terms of a mean reference level, and is variously characterized by such phenomena as poverty, famine, overpopulation, and a low quality of life: nutrition is inadequate (with an incomplete and insufficient protein diet), the birth rate is high, endemic diseases are still common (as a result, life expectancy remains relatively low), most of the area's population is engaged in subsistence farming, and there is a great lack of economic and social infrastructure (inadequate communications, waterworks, sewage systems, schools, hospitals, etc.). Among the most characteristic symptoms of underdevelopment are the great imbalances which, in varying degree, characterize the economic and social life of many lagging countries. There, in fact, we often find a notable discrepancy between the center and the periphery (not only on an urban but also on a regional scale); a few more active and productive zones are surrounded by vast backward areas with which they often have no link. Examples of such countries are India and Brazil, where a limited number of rich, developed areas, whose growth is frequently chaotic and tumultuous, and a restricted agrarian and entrepreneurial elite are confronted by a far more widespread reality of misery and indigence in a situation of extreme disparity.

Underdevelopment is basically caused by the lack of conditions which would favor the emergence of a process of accumulation and economic growth, which may be due to either internal or external circumstances. The former are related to historical, cultural, religious, and similar factors, among which the philosophical and religious outlook of a given people plays an important role. There are belief systems which equate the ideal life with detachment from power, wealth, and success, or those in which respect for tradition means a return to the past, a static approach, and the preservation of only the oldest customs. A people among whom such notions predominate obviously consider work a means of survival only and have little interest in accumulating economic wealth, much less in fostering a competitive attitude.

Other causes of underdevelopment derive from concrete problems of physical geography, especially those related to climate (aridity and famine, or, conversely, unexpected inundations and floods, etc.). The wrong economic choices, such as the widespread cultivation of poorly suited crops, or preferences granted a manufacturing sector lacking the necessary infrastructure, for example, may also have serious consequences. Moreover, in some cases, direct responsibility for the lack of growth must be laid at the door of certain corrupt ruling classes who are far more mindful of protecting their own interests than those of the people.

Among the external causes of underdevelopment are usually such negative factors as colonialism and its successor, neocolonialism. An important aspect of this latter phenomenon can be found today in what have been called "unequal exchanges," which tend to maintain the countries of the Third World in a position of economic backwardness because these developing countries can often export only, or primarily, raw materials or agricultural produce (and sometimes even only a single product) and must import or do without every other conceivable kind of commodity. The developed countries, on the other hand, assign a higher price to industrial manufactures (which incorporate the "value added" by skilled labor and the equipment used to produce them) and thus render the poorer countries constantly dependent.

Colonialism and neocolonialism. The relationships which the countries of the Third World have had in past centuries with the richer and more industrialized nations are among the main causes of underdevelopment. The onset of the modern era saw a few European countries conquer many regions of the world, leading to "colonialism," or the extension of sovereignty by powerful nations over territories with few inhabitants or a weaker economic and social organization of the population. Great Britain, France, Spain, Portugal, Holland, and other nations built their own economic development on the domination and exploitation of the colonized countries. Today it can be asserted that entire continents, such as the Americas and Australia, are "Europes outside of Europe": in past centuries these have been colonized, inhabited, and governed by Europeans who initially acted on behalf of the parent country, but

later made themselves independent of it.

In the colonized countries, the Europeans have long exploited the population and the riches, sometimes exterminating or decimating the original inhabitants (like the Aztecs and Incas in Latin America or the Aborigines in Australia) and have generally tended to exercise a harsh material and cultural domination. Colonialism therefore certainly does not favor local economic development or foster the formation of an active autonomous entrepreneurial class; if anything, it reinforces the power of local lords and rich landowners, often through internal tensions and conflicts.

Thus, even after regaining their independence (often at the cost of hard struggles), the countries of the Third World were long burdened by their negative colonial legacy. To this day, their frequently fragile economies—based as often as not on the marketing of a single product—are still controlled by the former colonial powers, which continue to manage the markets and thus determine the economic life of the developing countries (some of which are governed by ultraconservative leaders motivated by their own personal interests), accomplishing this also through financial investments and loans that reinforce their dependence and ties. This is the phenomenon of neocolonialism which, even if with connotations different from those of the past, continues to control the economic and political life of the developing countries and contributes to maintaining the imbalances between the world's North and South.

World hunger and future outlook. Famine is a daily tragedy of many Third World populations: World Bank and FAO data show that today half a billion people are undernourished or starving and that over a billion are "malnourished" because their diet is lacking in the necessary vitamins and proteins.

When nutrition is quantitatively insufficient, the ensuing "acute famine" is due to the concrete lack of calories indispensable for survival (the daily requirement is 2400–2500 calories). However, when the nutritional deficiency is qualitative, it leads to what has been called "occult famine," due to the severe shortage of certain substances necessary for healthy growth of the organism as a result of a one-sided diet based on a single plant food. As a consequence, the body is weakened by hunger and becomes sick, often falling prey to diseases such as rickets, beri-beri, scurvy, and the like, or becomes less resistant to the spread of infectious diseases or trachoma; extreme inanition finally leads to death by starvation which currently claims 50 million victims a year.

Is it possible to break the chain of underdevelopment, poverty, and famine? It is well to clarify that underdevelopment is not inevitably and solely due to the past economic and political oppression of the colonial powers, nor is it only linked to the lack of capital and natural resources. In general, it is determined by a complex concatenation of negative factors that make the possibility of reaching or even attempting a definitive solution exceedingly difficult. Breaking the spiral of poverty often requires changing a deep-seated cultural mind-set which in some countries would mean reforming political and social structures that have been dominant for centuries. Some nations have succeeded in this difficult task, sometimes achieving exceptional results (as in the case of Japan), but as often as not the path has been a bloody one, leading to dictatorship (as in Idi Amin's Uganda) or to intransigent forms of political or religious ideology (as in Cambodia and Iran, respectively).

The outlook for the future is still uncertain and will surely also depend on the help which the more advanced countries can and wish to extend to those still undergoing development. Until a few years ago it was thought that the economic growth of these latter countries could be brought about by large investments in the manufacturing sector on the part of the richer nations, resulting in the construction of many industries which, as it turned out, were often poorly integrated with local realities. The facts on the ground have rather demonstrated that real and lasting development must be founded on the actual internal resources of these countries and on the establishment of adequate economic and social infrastructures; only thus can their human and material potential be turned to advantage. However substantial the economic infrastructure may be in any given case, more essential still is the social infrastructure: in fact, improvements in average educational and health levels are of pivotal importance in launching a country's growth. But the difficulties involved continue to be considerable. They are further accentuated by the fact that it is precisely the less developed countries of the Third World which have the highest demographic growth, and this of course tends to maintain their infrastructure levels low, or even to decrease them.

It is therefore obviously necessary to coordinate international assistance and to tailor it to the individual local situations. It is only thus that the aid from the world's "center" will reach and profit its "periphery," generating an evolutionary phase destined to last in time.

ECONOMIC RESOURCES

The 20th century is marked by exceptional demographic growth, industrial research and development with an increasingly technological focus, the globalization of markets, the conquest of space (through aeronautics and telecommunications) and of outer space (through satellites, space probes, and missions), and environmental problems.

These themes—directly or indirectly also tied to problems related to the identification, possession, utilization, and replenishment of resources—then interact with the more strictly economic characteristics of individual countries, sometimes resulting in the creation of dangerous international political tensions.

Steven B. Jones has defined resources as a totality of factors, not all of which are material:

> *... anything a nation has, can obtain, or can conjure up to support its strategy.... resources are as tangible as soil, as intangible as leadership, as measurable as population, as difficult to measure as patriotism. There is no common unit, and no statistical summation is possible.*

For millennia the world economy drew its principal sources of sustenance from the most elementary sectors (agriculture, livestock raising, fishing, forestry, mining, and metalworking), with a modest contribution from manufacturing and trade. It was only during the second half of the 18th century that a sys-

tematic process of transforming goods began to take shape, supported by increasingly broad technological innovations, which led to the rapid development of industrial and commercial activities. This process is still in a phase of intensified evolution, marked by unexpected advances exemplified, for instance, by ongoing research in the field of biotechnology, in the utilization of special ceramic materials (superconductors), and in the harnessing of nuclear, wind, and geothermal energy. On the other hand, the increase in demand as a result of demographic growth and the improvement of general living conditions has led to more intensive and diversified use of available resources. For example, while little more than a century ago petroleum was used in very small amounts and only for illumination, today this natural resource is consumed in massive quantities in the energy and industrial fields. In other words, the development of new technologies (such as the application of the internal combustion engine to means of locomotion, or the adaptation of chemical synthesis processes to the production of textile fibers and plastics) has, in a sense, led to the "discovery" of resources that were previously not considered as such.

All this raises disturbing questions about the future ecological balance of our entire planet. In fact, "progress" has not been without its negative repercussions, most significantly reflected in the inequalities affecting the distribution of wealth among various nations, in damage to the environment, in the spread of new diseases, and in the decay of certain social and cultural values.

Human resources. The total number of individuals constituting a given country's "economically active population"—to use rather dry demographic terminology—is also a significant factor affecting the creation of revenue and the development dynamics of various economic realities. Over time, t' 's resource as well has undergone an extensive process of evolution that has often led to profound social, political, and economic changes which have left their marks along the human historical path. For example, the changes that occurred during the second half of the 19th century as a result of the labor movements that accompanied the development of the industrial sector reflected workers' growing awareness of their role in relation to the use of capital and the formation of wealth. In the past, human resources were symbiotically tied to and almost inseparable from land resources (characteristic of an agricultural economy) With the advent of industrial culture, these resources partly shifted to the development of a synergistic role with capital and rapidly moved toward a new tie with technology, which was increasingly regarded as an indispensable tool for the betterment of general living conditions. This meant a reevaluation of the human element and its more direct involvement in decision-making processes that stimulate and encourage general development. Unfortunately, however, these changes occur in varying measure from country to country, leaving behind vast "backward" areas, with resulting notable social and economic imbalances. In the industrialized nations the human/technology ratio has evolved rapidly, with the continuous creation of new tools to promote the production of revenue and alleviate the exertions of manual labor. In contrast, change has been decidedly slower in the underdeveloped and developing areas and is thwarted by a perverse mechanism by which the necessity of meeting basic needs often limits the attainment of more ambitious goals.

Agriculture and forestry. In antiquity, roughly 50% of the Earth's land was blanketed by forests; today 10% is used as farmland, 20% represents prairies and pastureland, 28% consists of woods and forests, and the remaining 42% is uncultivated and unproductive. Our constant overexploitation of arable soil, but above all the great demographic pressure witnessed in poorer countries, accompanied in the tropical regions by slow desertification (with the soil not always cultivated in accordance with the most appropriate methods), have resulted in a growing need for food. According to estimates made by the United Nations Food and Agriculture Organization, in order to solve the problem of malnutrition (which now affects over a billion individuals) cultivated land must be increased by 15% to reach a total of approximately 5 billion acres [2 billion ha].

According to Norman J. G. Pounds, writing in *Political Geography*, there is room for extending crop farming and expanding food production:

> *In all countries there is a little slack that could be taken up, if only temporarily, but the range of foods that could be produced is limited by conditions of soil and climate as well as by the volume of capital investment. Any permanent increase in the extent of cropland in such countries would involve the cultivation of land which is now considered submarginal. This, in turn, would necessitate larger labor or capital inputs, so that the return on effort or investment would be likely to become smaller. In this way the overall standard of living would fall, creating, perhaps, some kind of political resistance.*
>
> *We know with a fair degree of accuracy the extent of cultivated land in all countries of the world. What we need is comparative studies of the use of marginal and submarginal land. We need to know whether land of a quality which is left unused in Great Britain or New Zealand would have been cultivated had it been in Poland or Romania; whether and how the dry lands of the western plains of the United States would have been used if the Chinese who migrated to Manchuria had instead settled there. In other words, the extent of the agriculturally productive land is dependent, largely or partly, on the standard of living and the level of technological development of the people who cultivate it....*
>
> *It is impossible without further studies of this kind to say whether, to what extent, and under what conditions agriculture can be expanded.*

Agricultural lands, once used predominantly for extensive cultivation, are increasingly affected by new production technologies (crop rotation, mechanization of farming, seed selection, advanced irrigation systems, creation of new hybrids, and the use of fertilizers and fungicides as well as, unfortunately, pesticides and herbicides that sometimes have negative consequences). These technologies increase the land's productivity in terms of both quantity and quality. The development of trade, greenhouse cultivation, conservation techniques, and the improvement of transportation systems and international communications have made it possible for many different countries, regardless of their geographic position or growing season, to have access to agricultural products throughout the year. Thus, for example, countries in the Northern Hemisphere can obtain fresh fruits and vegetables even during the winter months, eliminating the previous need to wait for "early produce."

Side by side with the production of food, a lively agro-indus-

trial sector has developed that focuses on both the canning of agricultural products and their transformation into fruit juices and other beverages, frozen and pre-cooked foods, etc., either for immediate consumption or later use.

However, certain countries have socioeconomic inequities and unstable climates, so that there continue to be areas where there is a surplus production of food and others where local food needs are for the most part unmet, causing widespread malnutrition and underdevelopment. This problem is compounded by single-crop farming, which frequently characterizes such areas. The many countries where this takes place, already subject to meteorological instability (typhoons, floods, droughts) and periodic famine, also become dependent on world market prices. Excessive single-crop farming, often widespread and generally caused by chronic pressures of malnutrition, has frequently modified the vegetation of entire territories (for example the sub-Saharan region of Africa and the Amazonian forests), with a gradual and systematic depletion of tree cover and finally a general deterioration of the soil. More strictly industrial crops (cotton and hemp, for example) have had an increasing impact in certain regions, along with the development of the manufacturing sector, and in many cases constitute an important source of foreign exchange.

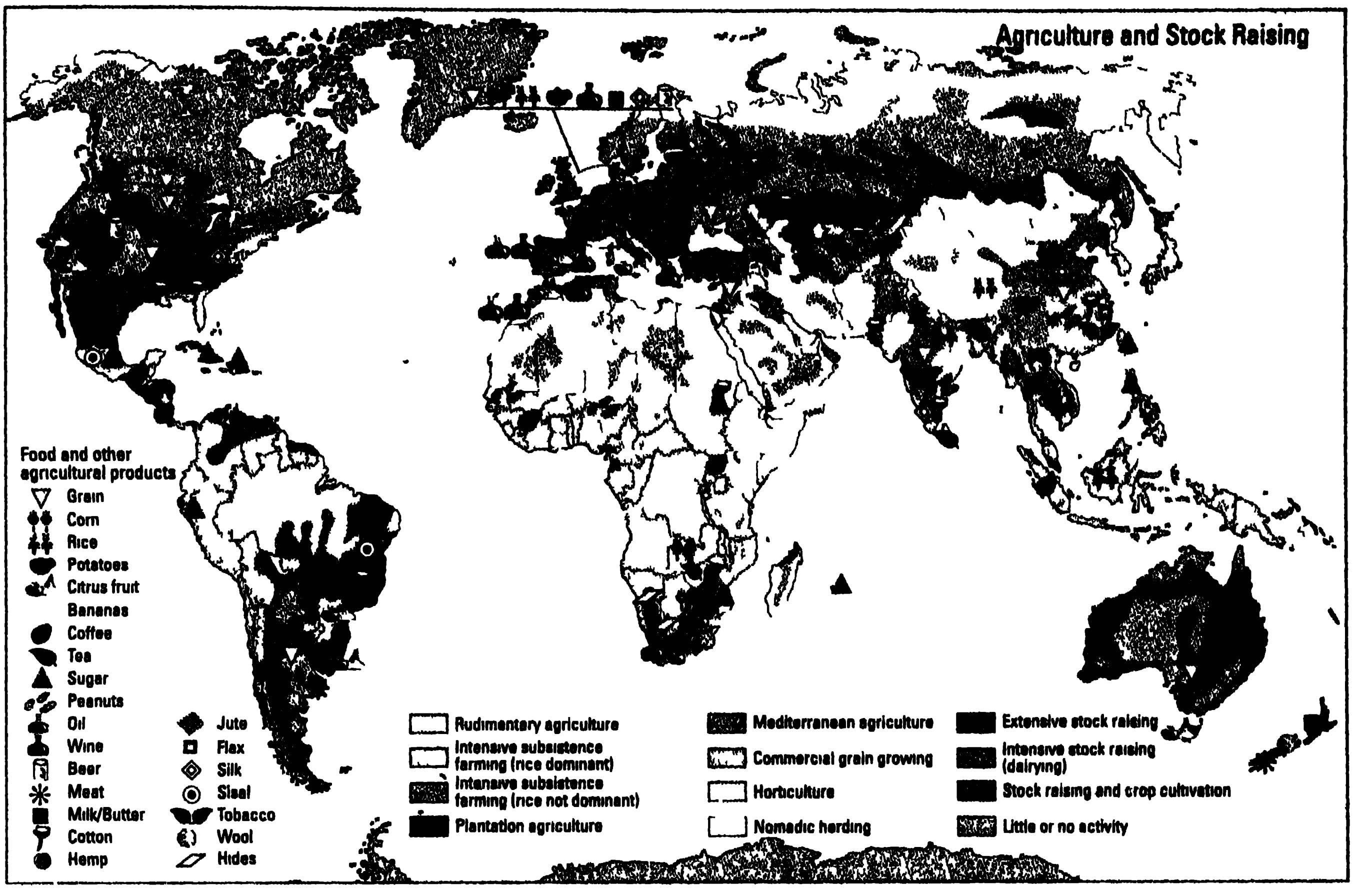
During the past several years the exploitation of forest resources in many countries has finally been subjected to more farsighted criteria that take into account the need to safeguard the local ecological balance. Furthermore, the utilization of wood and all its by-products (including processing waste and rejected material), together with the application of more advanced industrial technologies and the use of certain replacement plastic materials, has reduced the indiscriminate felling of trees and, therefore, helped (albeit still modestly) to preserve the world's forest resources.

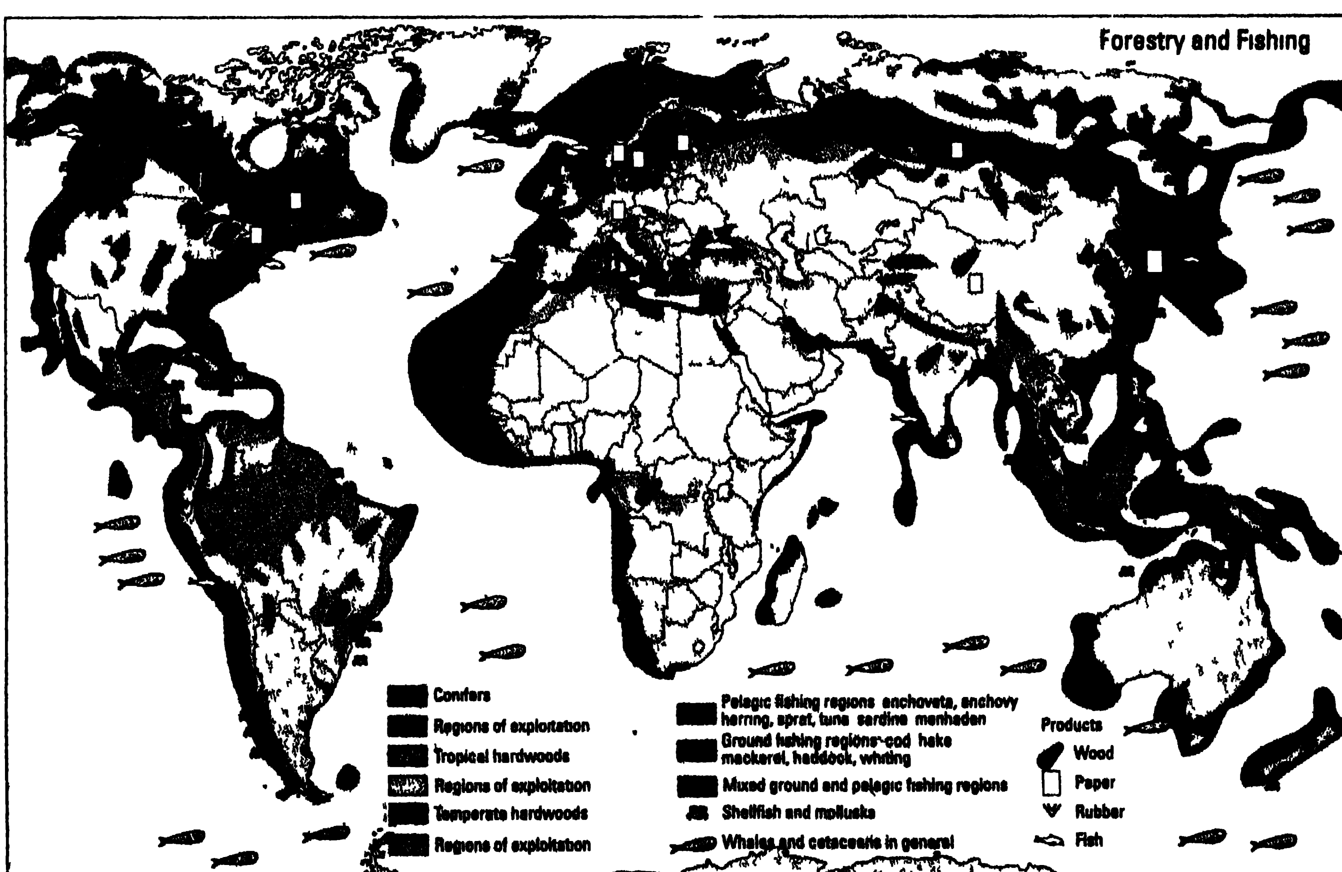
Livestock raising and fishing. As with the other sectors mentioned thus far, livestock raising has also been affected in recent decades by important structural and technological changes. The selection and improvement of breeds, the use of selected feeds, systematic disease prevention, more modern milking and slaughtering techniques, and advanced standards for the raising of fowl, among other measures, have appreciably increased yields and have promoted the growth of the dairy industry as well as those industries involved in the preservation and processing of meat and the use of animal by-products. However, this sector too is marked by some areas of surplus production (particularly in Europe, North America, and Latin America) and other areas where the use of livestock resources is still in a stage of underdevelopment.

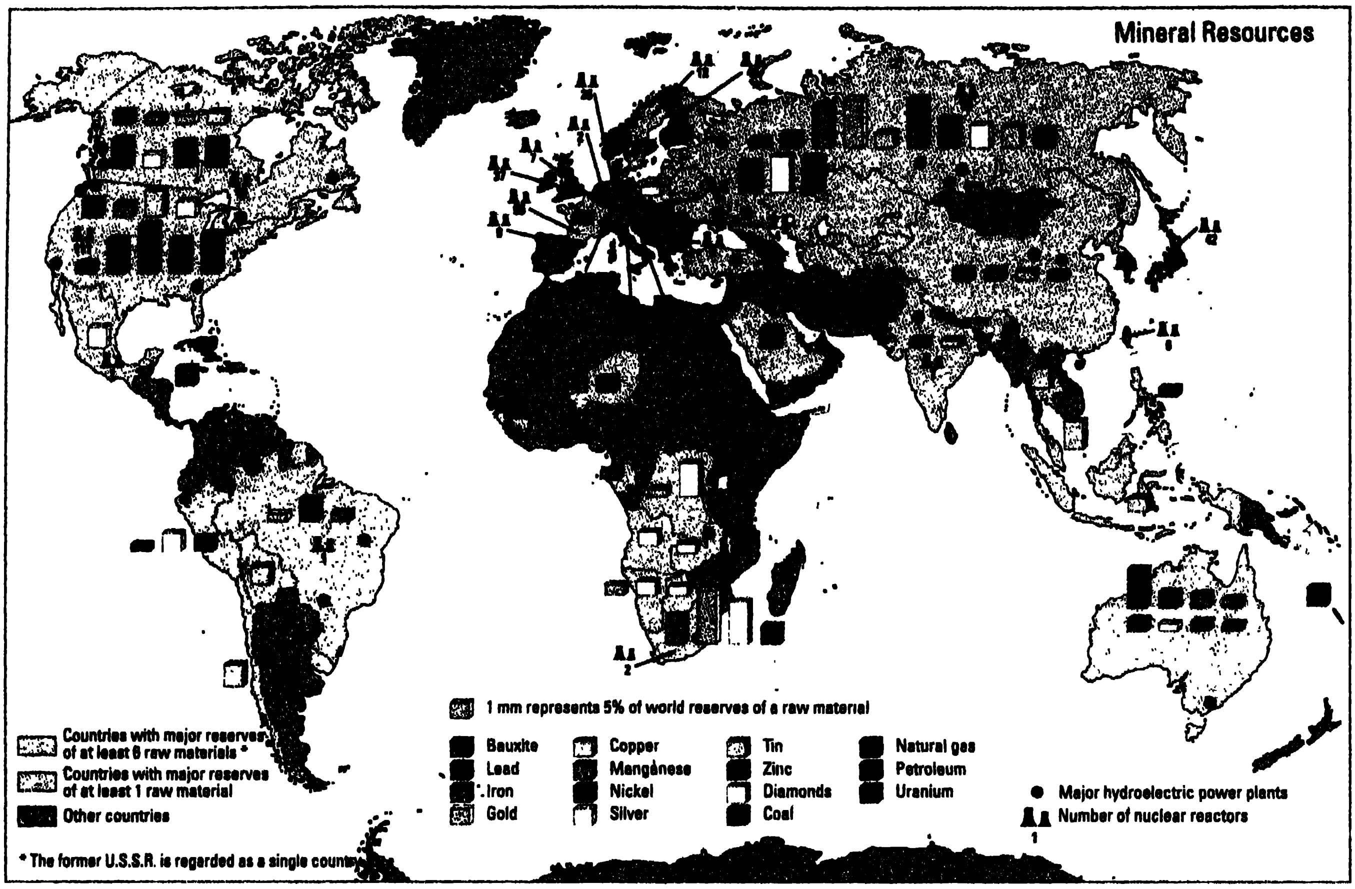
The fishing industry, which currently supplies just 5% of the world food supply, also exhibits some disturbing aspects that clearly merit closer attention by several countries, considering the repercussions on public health and the environment. The utilization of certain fishing methods (particularly dragnets) that are not always suitable to the maintenance of the necessary balance of sea life, and the progressive pollution of the oceans caused by excessive dumping of industrial toxic waste (that leaves traces of mercury, acids, and other harmful substances) or by the emission of hydrocarbons from oilfields and wells, have led to an impoverishment of marine life in many waters. Pollution is also considered to be one of the primary causes of the spread of certain diseases caused by the consumption of poison-containing fish products. However, one positive aspect counterbalances these negative effects: the utilization of modern fishing and canning methods has increased yields, and in recent years new fish-farming techniques have shown increasingly significant results.

Mineral reserves and energy sources. ***Oil, natural gas, and coal.*** Oil and natural gas—primary energy sources necessary for modern development—undoubtedly represent the resources that, more than any other, for better or worse have characterized the history (in economic and other terms) of the past century. Countries without other viable economic resources (such as many states in the Arabian peninsula, Iraq, Iran, Algeria, and Libya) or overpopulated countries (such as Mexico and Nigeria) which, once they reduced their commercial subjection to the international oil companies that long monopolized the market for crude petroleum and natural gas, found the means to develop these resources themselves by direct exploitation of reserves. This has allowed them to acquire huge amounts of foreign exchange and sometimes even to affect, through price mechanisms imposed by them, the economies of more industrialized nations. To coordinate oil trade policies on international markets, in 1960 the principal oil-exporting nations (Algeria, Saudi Arabia, Ecuador, United Arab Emirates, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, and Venezuela) formed OPEC (the Organization of Petroleum-Exporting Countries), a cartel with headquarters in Vienna that periodically convenes its members to agree upon the quantities of oil to be extracted and the prices to be charged for it on the market. Despite some internal problems (relating to differences of opinion about pricing strategies, the consequences of the war between Iran and Iraq, and Iraq's invasion of Kuwait, among other issues), the existence of OPEC has invested the principal oil exporters with contractual power that has influenced the market for many years and has led to their emergence as a new "group of nations" with considerable financial resources within the global economic arena. In certain cases, the excessive euphoria engendered by the availability of funds in these countries has obscured the need to implement sufficiently diversified development plans that would also not overlook other, alternative economic sectors. As a result, the economies of some of the oil-producing nations have become rather vulnerable to fluctuations in demand and, consequently, in the international prices for oil and natural gas. On the other hand, the more rational exploitation of such resources and their use in the industrialized nations has paved the way for the development of important industrial processes, resulting in an ever-greater expansion of the innumerable products that are obtained from petroleum and its derivatives.

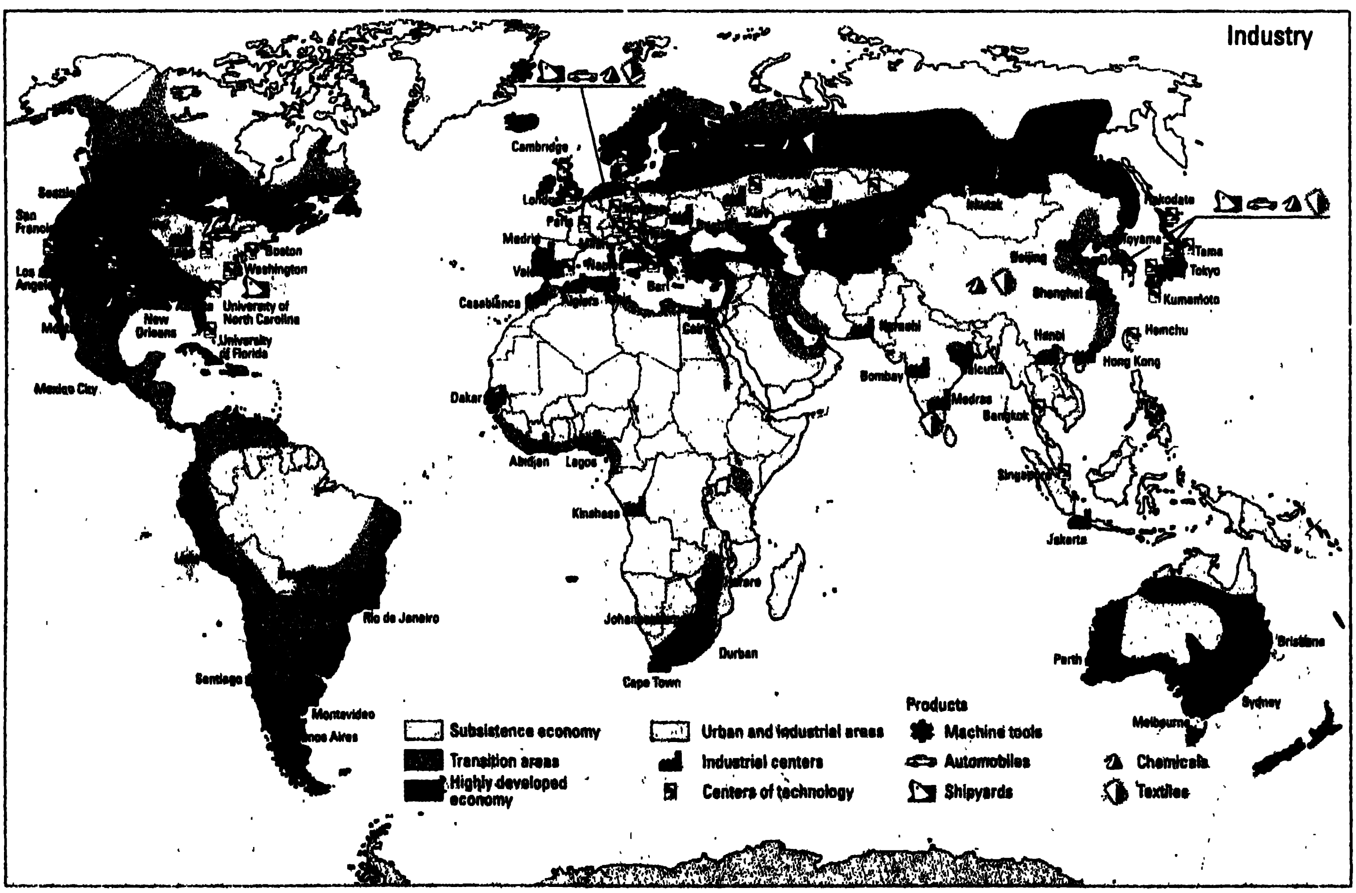
The exploitation of coal has been intermittent, depending to a substantial degree on the vicissitudes of the oil market. For a long time, "historically" one might say, the dominance of coal was uncontested, not only in the iron and steel industry and in certain aspects of the chemical engineering industry, but also in the field of basic energy production (gas and steam, electric power, home heating, cooking fuel, and so on). Coal then entered a second phase of lesser utilization, concomitant with the


Agriculture and Stock Raising
Food and other agricultural products
Grain
Corn
Rice
Potatoes
Citrus fruit
Bananas
Coffee
Tea
Sugar
Peanuts
Oil
Wine
Beer
Meat
Milk/Butter
Cotton
Hemp
Jute
Flax
Silk
Sisal
Tobacco
Wool
Hides
Rudimentary agriculture
Intensive subsistence farming (rice dominant)
Intensive subsistence farming (rice not dominant)
Plantation agriculture
Mediterranean agriculture
Commercial grain growing
Horticulture
Nomadic herding
Extensive stock raising
Intensive stock raising (dairying)
Stock raising and crop cultivation
Little or no activity


Forestry and Fishing
Conifers
Regions of exploitation
Tropical hardwoods
Regions of exploitation
Temperate hardwoods
Regions of exploitation
Pelagic fishing regions anchoveta, anchovy herring, sprat, tuna sardine menhaden
Ground fishing regions-cod hake mackerel, haddock, whiting
Mixed ground and pelagic fishing regions
Shellfish and mollusks
Whales and cetaceans in general
Products
Wood
Paper
Rubber
Fish



Mineral Resources
Countries with major reserves of at least 6 raw materials *
Countries with major reserves of at least 1 raw material
Other countries
* The former U.S.S.R. is regarded as a single country
1 mm represents 5% of world reserves of a raw material
Bauxite
Lead
Iron
Gold
Copper
Manganese
Nickel
Silver
Tin
Zinc
Diamonds
Coal
Natural gas
Petroleum
Uranium
Major hydroelectric power plants
Number of nuclear reactors



Industry
Cambridge
Seattle
Boston
Washington
University of North Carolina
University of Florida
New Orleans
Mexico City
Madrid
Casablanca
Dakar
Abidjan
Lagos
Kinshasa
Rio de Janeiro
Santiago
Montevideo
Cape Town
Durban
Irkutsk
Beijing
Shanghai
Hakodate
Tama
Tokyo
Kumamoto
Hsinchu
Hong Kong
Hanoi
Karachi
Bombay
Madras
Bangkok
Jakarta
Perth
Brisbane
Sydney
Melbourne
Subsistence economy
Transition areas
Highly developed economy
Urban and industrial areas
Industrial centers
Centers of technology
Products
Machine tools
Automobiles
Shipyards
Chemicals
Textiles

greater availability and easier extraction of petroleum. During the early 20th century, 70% of energy production was derived from coal; today it supplies only 29%. Following the 1973 oil crisis, which precipitated, among other things, a broader and more diversified use of alternate energy sources (obtained from nuclear, wind, hydroelectric, and other power) and a new concern for long-term oil conservation, coal mining once again became economically viable, and many mines that had been abandoned because they were considered to be unprofitable were reactivated.

Mining. The development of new industrial technologies and the demand for increasingly sophisticated products, particularly in the metallurgical and machine industries, requires (and often permits as well) the intensive exploitation of mineral resources and the use of materials that, until early in the 20th century, were of scant economic interest (such as uranium, cadmium, strontium, vanadium, and the like). The availability of such resources, which are sometimes termed "strategic," is often limited to restricted geographic areas, and, almost ironically, the countries where they are located are often in no position to utilize them directly, due to lack of adequate processing technologies. Thus, a situation is created where many producer countries are subordinate to user countries.

In recent decades, the exploitation of traditional metal ores has gone from an "extensive" to a more "intensive" phase, as the richest and most easily accessible fields have gradually neared exhaustion. For example, the numerous copper mines in Zambia and Zaire, located predominantly in the Copperbelt region, formerly yielded high metal-content ore (70–85%) from open-pit mines. The ore was then rather crudely refined and sold to user nations. With the gradual impoverishment of the richer and more readily accessible deposits, ore began to be extracted from "tunnel" mines, and in some cases the slag left over from prior refining processes was used to recover any copper left behind and to obtain other previously neglected "by-products," such as cobalt, silver, and gold. The main problem that many countries, particularly in Africa and South America, must resolve in order to more thoroughly take advantage of their mineral reserves is the difficulty of finding the enormous capital necessary to modernize mining and refining facilities and to create adequate infrastructures for transporting the ores.

Energy production. Energy production to satisfy the requirements of industrial development and motorization currently comes from oil (45%), coal (29%), natural gas (19%), hydroelectric sources (6%), and nuclear plants (1%). Some estimates indicate that over 50 trillion kWh of energy are consumed worldwide each year (on average in recent years), approximately 70% of which is used by industrialized or recently industrialized nations and the remaining 30% in developing, or Third World, countries. It is important to note that while in 1860 world energy consumption totaled 1.1 trillion kWh and in 1900 the figure was 6.1 trillion kWh, only 40 years ago annual global consumption had already reached approximately 21 trillion kWh. These numbers were destined to increase, due to further industrial development and population growth, and it is now predicted that energy needs in the year 2000 will be about 240 trillion kWh.

In terms of electric energy alone, in late 1988 installed power in the world was estimated to be over 2.6 billion kW, of which 23% was supplied by hydroelectric plants, 58% by conventional thermal stations (fueled by coal, oil, and gas), 6.5% by gas turbines, 12% by nuclear power plants, and the remaining 0.5% by geothermal plants. The primary energy reserves (oil, coal, gas, and uranium) should be sufficient to satisfy increasing energy demands, at least for some decades to come. However, considerable problems are foreseen in terms of both distribution (since the location of energy resources does not always correspond geographically to the areas of demand) and ecology (measures to protect the environment and to decrease or prevent pollution will impose ever-greater restraints on the creation of new facilities). One sector that will become increasingly important in future years is the production of renewable types of energy (hydroelectric, solar, wind, and biomass) which, if adequately utilized, could clearly go a long way toward reducing anxieties about further ecological damage and help to conserve primary energy reserves.

Industrialization. The economic development process of various countries tends for the most part toward a more balanced distribution among the primary (agriculture, livestock raising, forestry, and mining), secondary (industrial activities), and tertiary (trade, financial industries, and services) sectors that make up the GDP. And yet variations in local climatic, demographic, cultural, economic, financial, sociopolitical, and other conditions, as well as in the availability of natural resources, result in discrepancies in what realistically can be achieved. Thus there are certain situations where existing economic disparities among nations are further accentuated rather than reduced. Paradoxically, the general "road to development," while legitimate, finds greater possibilities for success in areas where basic requirements are already present and encounters much more difficult obstacles in less fortunate regions. A current if somewhat arbitrary classification divides nations into three major groups, according to the level of industrial development achieved: industrialized nations, newly industrialized nations, and "developing" nations—the so-called Third World (areas of extreme poverty).

Industrialized nations. In the more economically advanced nations (including the United States, Japan, Germany, France, Great Britain, Italy, and Canada, which together are called "the Group of Seven" or "G7"), industry is becoming ever more sophisticated, largely as a consequence of enormous investments in scientific and technological research, with an increasing use of electronics, robotics, computers, and production processes that utilize innovative materials, and with a decreasing use of unskilled or unspecialized labor. All this has proven necessary to maintain international competitiveness, that is, in order to adequately compete with the more recently industrialized nations. On the other hand, this continual technological renewal implies a rapid obsolescence of existing facilities and related production processes which, to some extent, are transferred to less developed countries, where they find more favorable conditions, including lower costs for labor and raw materials. The emphasis on high technology (which often accompanies the necessity to both reduce labor costs and curtail possible environmental damage) also implies to some degree the gradual abandonment of production that once gave rise to so-called "heavy industry" (particularly in the iron and steel and

basic chemical sectors). There is likewise a tendency to favor the growth of enterprises that are smaller in scale but more innovative and clearly in a better position to make use of technological advances.

Berardo Cori explains how this evolution has progressively outlined a new industrial geography:

Some speak of the "electronic revolution," and in effect many recent changes are linked to the growing use of electronic control and programming mechanisms in industrial processes and to the spread of computer technology. The electronics industry has totally liberated itself from old factors of industrial location, including those that remained valid in neotechnical times, and has been able to make other sorts of connections. The weight of raw materials has ceased to be important and, for all practical purposes, the market is global and therefore not bound by spatial considerations. Needed, however, are capital, entrepreneurial spirit, and above all research, and these are found in "technological parks," located in "brain fields" consisting of large universities with strong scientific-technological orientations. Silicon Valley—a flat strip of land roughly 30 mi [50 km] long by 10 mi [15 km] wide between San Francisco and San Jose, California, which owes its name to silicon, the raw material used in the manufacture of computer chips—is a prime example. Its development engine is Stanford University, its annual sales US$40 billion, its principal products pocket calculators, video games, personal computers, cordless telephones, laser technologies, microprocessors, and digital watches.

Other technological parks are rapidly emerging in the U.S., Japan, and even here and there in old Europe.

Newly industrialized and eastern European countries. In recent decades some newly industrialized nations have appeared on the world stage (including South Korea, Hong Kong, Taiwan, and Brazil); these have been joined even more recently by the countries of eastern Europe. In the former group, the process of industrialization has witnessed extraordinarily rapid development, with, even at the beginning, an emphasis on the acquisition of fairly advanced technological processes. In eastern Europe, however, while there is a good level of basic industrialization and often notable resources in terms of raw materials and specialized personnel, technology is generally behind the times, making it difficult for these countries to compete internationally, in terms of quality and otherwise, with more advanced nations.

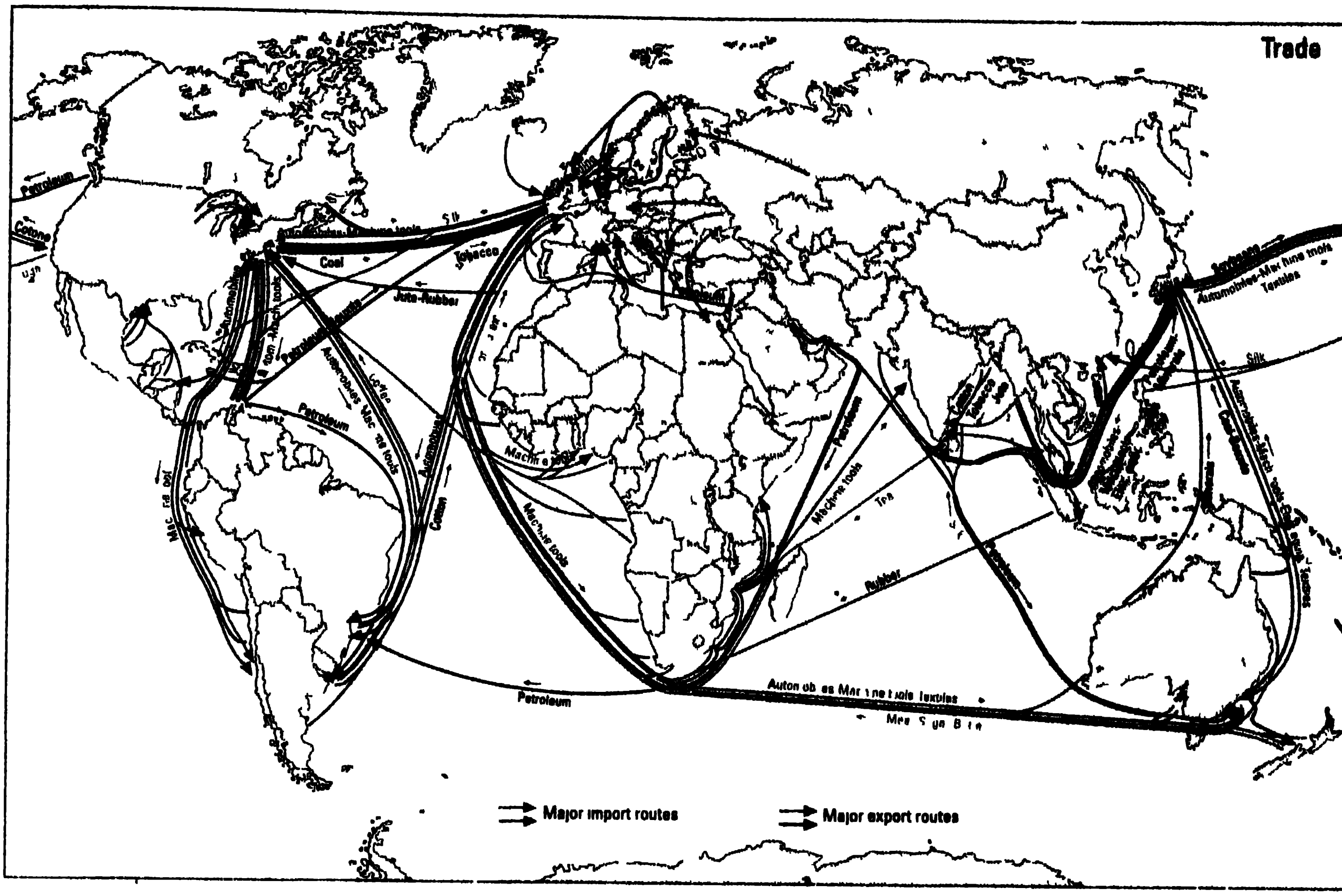
Developing and Third World countries. Current development models show that within a relatively brief period the existing gap between the most advanced and the more recently industrialized nations will decrease. This is in part a result of the relative ease with which the latter will be able to assimilate and make use of the experience gained by the former, although it is also true that there will clearly be limits to the ability of the newly industrialized nations to implement ever-greater technological advances. Yet there are many countries where the process of industrial development has failed to find satisfactory outlets and still others for which true industrialization remains little more than an aspiration. The situation in these Third World nations is further aggravated, particularly in recent years, by difficulties encountered in obtaining loans from the international financial system necessary for the required investments. Furthermore, the international market for raw materials—often the only true economic resource of many of these countries—generally continues to be in a slump. There is a constant flow of experience and production processes from technologically highly advanced areas to those undergoing industrialization ("technology transfer"), and this flow, as was noted, may soon lead to a gradual reduction in current discrepancies. By contrast, the flow between these first two groups and the "developing" nations is significant in quantity only, but scant in quality, since it involves for the most part obsolete technologies (sometimes with insurmountable difficulties in terms of subsequent maintenance and availability of spare parts) which do not always meet the development needs of these regions. For example, there have been industrial initiatives in countries where it was then impossible to complete or to maintain facilities due to lack of raw materials, spare parts, professional personnel, or concrete ways to market the finished products.

The example of China demonstrates how classification into different "worlds" is often theoretical and continually changing. China straddles the newly industrialized and Third World categories and for over a decade has shown growing openness toward more advanced economic models.

Norman J. G. Pounds, cited above, warns that the imbalance between developed and underdeveloped nations is extremely risky in the long run:

The improvement of the level of human welfare is a matter of deep concern not merely to those peoples whose standards are low but also to those with the highest. All parts of the world and all peoples are so closely interknit that the privileged and the underprivileged cannot live side by side without danger to the former. The highest national incomes per capita are based upon factory production, which is most successful when it is carried out on a massive scale. The developed countries need markets, which the peoples of the developing world could supply if their purchasing power were increased. The imperialisms of the nineteenth century were to some degree attempts to use the purchasing power of the dependent territories in the service of the industries of the imperial powers. But the imperialists' policy of using the purchasing power of colonies to absorb their own industrial surpluses tended, in general, to stereotype a pattern of industrial countries on the one hand and of agricultural and primary producers on the other. Such an international division of functions and responsibilities is dangerous. In times of slump or depression, the prices of agricultural and primary goods drop more sharply than those of manufactured goods, with social consequences that may be serious in the extreme.

Recycling of garbage and industrial waste. What was for the most part considered "waste" in the past and was therefore simply thrown away or destroyed assumes increasing significance within the context of safeguarding the environment, as well as in terms of depleting available resources. Driven by these needs and their recognized economic validity, numerous activities have arisen in recent years that focus on the reuse of so-called "secondary materials," which include residues from the processing of raw materials and semifinished products (industrial waste, recovery of oils and lubricants, and the like), as well as solid household waste (paper, cardboard, glass, cans, and even certain plastics). This is a totality of resources that in their turn can serve as a supply for the process of industrial transformation (it is estimated, for example, that over 30% of


Trade
Petroleum
Cotton
Coal
Tobacco
Jute-Rubber
Silk
Machine tools
Cotton
Rubber
Petroleum
Tin
Textiles
Major import routes
Major export routes


Time Zones

metallurgical and machine production today is obtained through the use of metal scrap) or in certain cases can produce thermoelectric energy, fertilizers, and more. This demonstrates a new consciousness and the proper collective reaction of humanity to the indiscriminate consumerism that has accompanied the enhanced well-being of recent decades. The collection and recycling of "secondary materials" clearly will constitute an increasingly significant economic aspect of the future.

Communications, trade, and commerce. We are experiencing a constantly increasing "globalization" of markets, meaning the integration, both territorial and functional, of existing trade relationships among individual nations that differ in more than merely economic terms. This expansion of borders (political, cultural, economic, and social) is facilitated first and foremost by the developments in communications and a renewed necessity for "dialogue" among peoples On the other hand, there are also certain tendencies that accentuate local differences (a demand for greater local autonomy, the aspiration of various countries to greater self-determination in economic policies, and so on) and lead to the implementation of forms of protectionism (the erection of trade and tariff barriers), which no longer makes sense in a world that should seek to better integrate available resources in order to achieve the harmonious development of the various economies and the gradual elimination of existing imbalances.

The technological innovations that have characterized recent decades have radically transformed the entire communications and transportation systems and further reduced existing distances between countries. The use of telecommunications satellites, new radio and telephone systems, fiber optics, and cable communications systems, as well as the development of telecommunications networks, have made it possible for the transmission of images, sounds, and data to become an everyday reality, with further advances expected and now considered a primary component in the process of cultural and economic development. Innovations in the field of transportation of people and goods have influenced both the means employed (ships, airplanes, highways, and railroads) and their management. There has been an attempt to increasingly optimize the supply of services, with a search for the most satisfactory balance among the demands for speed (transportation time), quantity (of people or goods to be transported), and convenience (costs). With regard to maritime transportation (the overall gross tonnage of the merchant marine worldwide has increased from 130 million metric t in 1960 to over 424 million in 1990), the most significant innovations have been seen in the construction and use of supertankers, container or multipurpose ships, and so-called "roll-on, roll-off" ships, as well as in the expansion of port infrastructures (systems for loading and unloading as well as for the storing and sorting of merchandise). Some commercial ports (Rotterdam, Antwerp, Hamburg, Chiba-Tokyo, Yokohama, Singapore, and others), in part as a result of the use of highly advanced equipment (such as robotized movement of containers), take on the appearance of true technological cities. Air transport has also benefited from continual improvements in aeronautics and aerospace technologies, which have become particularly necessary to facilitate communications between distant or remote regions (for example, linking major locations in South America) or to transport urgent or perishable goods (such as medicines or spare parts). Highway transport has also assumed increasing significance, both in terms of commercial (passengers) and industrial (goods) usage, with a corollary broad development in highway and superhighway networks. It was recently estimated that there were 561 million automotive vehicles on the road in 1989 (in 1960 the number was only 135 million). Railroads, with a worldwide network of approximately 772,000 mi [1,245,000 km] have experienced a modest reduction compared to the past (in 1960 there were 778,800 mi [1,256,000 km]), due in part to competition from air and highway transport, and have reflected some territorial imbalances, infrastructure decay and construction delays that in some cases have slowed general development. While many important cities have seen the creation of advanced urban transportation systems (monorails and subways), numerous extraurban railways are showing signs of obsolescence or inadequacy, often making them difficult or uneconomical to use. The regions most affected by these lags in progress are Latin America, Africa, and central Asia, where, among other factors, differences in track gauge prevent the integration of rail systems.

GENERAL GEOGRAPHY

Images

1. *The M33 spiral galaxy. Looking like whitish spots of various sizes, galaxies are aggregations of stellar material and interstellar gas scattered throughout the universe, and are similar in structure and configuration to the Milky Way, the galaxy which includes our own Sun and its planetary system. Most galaxies visible through telescopes look like flattened disks with spiral arms extending outward around a central core.*

2. *The 3C273 quasar, in an image obtained in the x-ray spectrum. A quasar (the name is a contraction of "quasi-stellar radio source") is an extremely bright celestial body that emits quantities of energy equivalent to those of a galaxy but, as its name indicates, has dimensions similar to a star. Quasars were discovered in 1963, and research has not yet clearly defined their physical nature.*

3. *The Earth as seen from the lunar surface, in a photograph taken from Apollo 8. The Moon, the Earth's only natural satellite, emits no light of its own; it is made up of solid material with a surface consisting of hundreds of craters of volcanic and meteoritic origin, as well as large flat areas called "maria" (seas), visible from Earth as light-colored patches separated by dark patches erroneously referred to as continents. The absence of water and an atmosphere, together with extreme temperature swings (from -220° to 300°F [-140° to 150°C], excludes any possibility of life.*

4. *A lunar eclipse over the dark waters of the Pacific. This phenomenon occurs when the Earth comes between the Sun and the Moon, aligning with them along a "nodal" line. Lunar eclipses can be penumbral, partial, or total, depending on how much of the moon falls within the conical shadow cast by the Earth that blocks light from the Sun. Given the period with which the Moon revolves around the Earth, a lunar eclipse is generally followed or preceded by a solar eclipse at an interval of about two weeks.*

5. *Total solar eclipse. This phenomenon is caused by the presence of the Moon directly between the Sun and the Earth. Because the Sun is so large and the Moon's shadow cone is of limited size, total eclipses of the Sun, which occur when the Moon (at perigee, the point at which it is nearest the Earth) crosses one of the nodes during a new Moon, are visible only along a fairly small strip of the Earth's surface. Annular eclipses occur when the Moon crosses a node and is at its greatest distance from Earth (apogee).*

6. *The Earth, photographed from Apollo 8 in 1968. Visible beneath the cloud formations are the expanses of the Atlantic and Pacific Oceans, with the Americas between them. With geostationary satellites, it is now possible to make numerous geodetic observations that provide a more accurate picture of the real dimensions and shape of the Earth.*

7. *The midnight Sun over Malnesfjord in Norway, at Langøya island in the Vesterålen group north of the Lofotens (latitude 68° 45' N). Above the Arctic Circle (66° 23' N) the Sun remains visible day and night during the period between the vernal equinox (March 21) and autumnal equinox (September 23), in an area that narrows gradually from the Arctic Circle to the North Pole. The longest period of daylight occurs at the summer solstice (June 21), when at midnight the Sun just touches the horizon at the Arctic Circle and rises to an angle of 23° 27' above the horizon at the Pole (90° N). The same situation occurs at the South Pole, but at the opposite seasons.*

8. *The world's first modern map, published by Abraham Ortelius (1570) and now in the collection of the University of Zürich library. Since antiquity humans have faced the problem of depicting the Earth's surface. Its spherical nature, already postulated by Eratosthenes some 25 centuries ago, was the basis for Christopher Columbus' first voyage across the Atlantic. On Ortelius' map, note the indication of an Antarctic continent, which was believed to exist at that time but had never been sighted (Terra australis nondum cognita).*

9. *Satellite image of an urban area. The imaging system captures electromagnetic waves reflected from various points on the Earth's surface using sensors located inside suitably equipped artificial satellites that move in defined orbits around the Earth, generally at altitudes exceeding 500 mi [800 km]. The electromagnetic radiation captured by the satellites is in turn sent back to Earth, where it is recorded by special radar installations and then analyzed by specialized computers that convert it into tiny images (pixels) each representing a portion of the Earth's surface between 1000 and 10,000 ft² [100–1000 m²] in size. When these pixels merge into a larger depiction*

they then form images which simulate the appearance of a true photograph.

10. *The Hex river valley in South Africa, about 60 mi [100 km] north of Cape Town, interrupts the continuity of the Langeberg range before flowing into the Breë river, which in turn flows into the Indian Ocean. The subtropical climate at these latitudes (about 33–34° S) and the availability of moderate precipitation have promoted river erosion and subsequent sedimentation in the valleys, which now support intensive agricultural activity associated, as in this case, with a large but dispersed population. The main communications route between Cape Town and the country's interior also passes through the Hex river valley.*

11. *The Manang river valley in Nepal. The southern slopes of the Himalayas, intensely watered by precipitation brought in by the monsoons in summer (approximately 80 in. [2000 mm] on average), exhibit a dense network of valleys that are still being shaped by the river erosion that has widened and deepened them. In their lower courses, these valleys have been filled with sediment by these same rivers as they drop their loads of detritus, forming a flat valley bottom that is particularly suitable for cultivation and settlement.*

12. *The Mont Blanc massif, seen from the Veny valley. This environment is dominated by glacial erosion and deposition. The current phase, in which most Alpine glaciers are retreating, has left fresh (that is, unaltered) moraine deposits even in the Val d'Aosta, consisting of sand and pebbles. On the steepest slopes, note the development of a conifer forest, the upper limit of which is less than 6500 ft [2000 m] above sea level.*

13. *The village of Gibellina, in western Sicily, which was destroyed by the earthquake of 1968. Earthquakes are the result of vibrations (seismic waves) produced by a sudden release of energy at a certain point within the Earth's crust, at a depth of no more than a few dozen miles. This release is actually the resolution of particular states of tension: fracturing of a rock body subjected to powerful dynamic stress, or resumption of activity in an earlier fault with movement of its sectors. At the Earth's surface, seismic waves can produce both vertical and horizontal oscillations, and their velocity, both within and outside the crust, seems to be closely linked to the types of rock through which they pass.*

14. *Spectacular view of the San Andreas fault, one of the largest fractures in the Earth's crust, located on the western edge of California's Central Valley. This important tectonic boundary is part of a band of other faults present in the contact zone between two great crustal plates, the Pacific and the North American. It is an active fault and therefore a frequent site of intense seismic phenomena, and is constantly monitored: two large population centers—San Francisco and Los Angeles are located at its ends.*

15. *Night view of Mt. Etna erupting from its central crater, hurling out lava and incandescent ash. Etna, the largest active volcano in Europe, is also one of the most intensively studied, and because it is continuously active is in fact one of the least dangerous, although in the past its lava flows have extended to some coastal villages and even as far as Catania. Its output consists predominantly of extremely fluid basaltic material, which often emerges from side vents.*

16. *Sulfur crystals in a bitumen matrix, from the Sicilian sulfur deposits. Each crystal is about an inch [3 cm] long. Sulfur is very common in nature, both as a free element (in evaporite sedimentary deposits or near oil fields) and combined into minerals, such as sulfides and sulfates. In solfataras (the last stage of a volcano's activity), sulfur is formed at high temperature due to sublimation of sulfuric acid.*

17. *Bicolored tourmaline crystals from the Cruzeiro mine at São José de Safira in Brazil (each crystal measures about 2 × 1 in. [6 × 2.5 cm]). Tourmaline is a complex silicate of aluminum and boron that is found mostly in metamorphic intrusive igneous rocks. It normally occurs as trigonal prismatic crystals in various colors from blue to green to pink, depending on composition.*

18–19. *Sections of rocks seen through the microscope. Igneous rocks—those derived from solidification of a magma—can form within the Earth's crust, in which case they are called "intrusive," or outside on the Earth's surface following a volcanic eruption, where they are called "extrusive" or "effusive." Highly crystalline intrusive rocks include granite (first photo), syenite, and gabbro. Effusive rocks include porphyry, trachyte, and basalt; the latter has a low silica content and is therefore basic (second photo).*

20–21. *Sections of rocks seen through the microscope. Metamorphic rocks are the result of chemical and physical transformation of either igneous or sedimentary rocks due to high pressure and temperature, including contact with magma bodies themselves. These rocks are identified by their schistose appearance and the presence of crystals. They include gneiss (first photo), mica schists, and marble, the latter created by the metamorphosis of limestone (second photo).*

22. *Alternating layers of limestone and marl in a stratified outcropping in the Alpine foothills of Lombardy (northern Italy). Both are sedimentary rocks, the former made up mostly of calcium carbonate and the latter of a mixture of limestone and clay. Both are deep-sea deposits and are often rich in microfossils, such as* Foraminifera, *single-celled organisms that live in the open ocean. In the photograph, the strata appear slightly tilted due to a tectonic dislocation that has changed their original horizontal orientation.*

23. *Fossil imprint of a trilobite, an organism belonging to the arthropod class. A species typical of the marine environment, trilobites lived throughout the Paleozoic era (from the Cambrian to the Permian). Their bodies were divided lengthwise into three lobes. Excellent index fossils, trilobites were already highly differentiated by the beginning of the Cambrian, but became most widespread between the end of the Cambrian and the Ordovician.*

24. *Specimen of a fossil plant,* Latanites praticensis, *now in the museum at Bolca in the Monti Lessini region of Italy. This species of palm lived in the early Cenozoic (Eocene–Oligocene) and become incorporated into the limestone deposits of the hills around Verona, which originally formed in a near-shore environment (probably a lagoon or lake) characterized by a generally tropical climate.*

25. *Specimen of a fossil fish,* Vomeropsis triurus, *from the collection of the museum at Bolca near Verona in Italy, recovered from marine sedimentary deposits in the foothills of the Lessini Mountains, dating from the first half of the Cenozoic (Eocene and Oligocene). Bolca has one of the richest deposits of fossil fish from this period, first discovered in the 16th century.*

26. *Ammonites, fossil mollusks belonging to the cephalopod class, lived from the Devonian period of the Paleozoic era (400 million years ago) until the end of the Cretaceous (65 million years ago), and were widely distributed. Living cephalopods include species of the genus* Nautilus, *which wander the tropical Pacific*

Ocean, housed in an elegant shell.

27. *False-color image of a full circle of the* aurora borealis, *recorded from space by the Dynamics Explorer satellite on September 15, 1981. The auroral ring completely surrounds the North Pole. The lighter area corresponds to the part of the Earth directly illuminated by the Sun. The "Northern Lights" are a phenomenon that occurs in the night sky at high latitudes, forming rays, bands, arcs, and curtains that are often red or green; they are caused by interaction between subatomic particles ejected by the Sun (components of the "solar wind") and oxygen atoms and nitrogen molecules in the upper atmosphere.*

28. *A fog-shrouded landscape seen from Mt. Shasta in northern California. Fog is a stratified formation produced by condensation of the water vapor present in the lower atmosphere, particularly at ground level. It consists of tiny droplets of water. Conditions favorable to the formation of fog include the presence of condensation nuclei (atmospheric dust, industrial fumes, etc.) and cooling of the air as soon as it has taken up moisture due to the water contained in the top layers of the soil evaporating, which in turn is promoted by direct sunlight.*

29. *A cloudscape at sea. Clouds are masses of tiny particles of water or ice suspended in the atmosphere, and represent the direct result of condensation or sublimation of water vapor following cooling of a moist air mass in contact with a colder air mass, or as a result of rising toward colder layers of the atmosphere. When the water or ice particles become so large that they can no longer be supported by the air, they fall as precipitation, either liquid (rain) or solid (snow and hail).*

30. *A low-pressure area over northwestern Europe, in a false-color image taken by the NOAA-9 satellite on August 6, 1987. The image clearly shows a large cloud system, with its characteristic spiral shape, covering the British Isles and the northwest corners of France and Portugal. Bands of clouds also cover Norway, southern Italy, Sicily, Greece, and northern Africa. The entire cloud system is rotating counterclockwise and moving from west to east.*

31. *A view of the sea floor with benthic fauna in a neritic environment (such as corals) which remains attached to the bottom and generally lives at moderate depths, often in association with plant species (algae). These life forms need abundant light in order to survive.*

32. *Victoria Falls on the Zambezi river, at the border between Zambia and Zimbabwe. This majestic and picturesque shelf of rock is about 400 ft [120 m] high. A sudden change in the slope of a watercourse is generally due, as in this case, to the presence of a fault breaking the continuity of the rocky substrate over which the water flows. This situation is quite frequent in regions with a tabular structure such as southern Africa.*

33. *Ullswater, in the Lake District of northwestern England, has an elongated shape like many other lakes in Cumberland, since it occupies the bottom of an ancient valley shaped by Pleistocene glaciation (first part of the Quaternary era). During this period the glaciers fanned out from the central mountain of the region, Mt. Helvellyn, which at present is only 3100 ft [950 m] high.*

34. *Muldrow glacier, which descends from Mt. Brooks (11,936 ft [3639 m]) in the McKinley group in Denali National Park (Alaska). Meltwater from this glacier, which runs down toward the plains west of Fairbanks, flows into the Yukon river.*

35. *Sand dunes on Playa de los Inglés, in the southern part of Gran Canaria island in the eastern Atlantic, with their characteristic golden tinge. These dunes are typical accumulations of sand formed by the action of wind on very fine material, either discharged into the sea by rivers or derived from incessant pulverization of rocky detritus by wave action along the shore.*

36. *Vertical walls cut into the limestone sediments of Gris Nez west of Calais in northern France, where the Artois hills meet the sea. Such cliffs are the result of erosion by the sea against a high, rocky coast, into which it carves a notch at the base. As the notch gets larger, the cliffs above collapse, causing the coastline to retreat inland.*

37. *A landslide along the coast of California has completely severed a road. Landslides can occur in almost any kind of terrain for a wide variety of both endogenous and exogenous reasons. Factors involved include precipitation, seismic movements (as in this case), and excessive deforestation of slopes.*

38. *Stalactites and stalagmites in the famous Altamira caves of northern Spain, known for their prehistoric rock paintings. Formed as rainwater dissolves limestone or gypsum formations, underground caves generally contain these particular kinds of concretions (stalactites hanging from the roof, stalagmites on the ground), made of calcium carbonate which precipitates in crystalline form due to constant dripping of the water.*

39. *These typical marine erosion landforms are known as the Twelve Apostles, towering pillars just offshore from a high, rocky stretch of the southern Australian coast. The action of ocean waves produces intensive mechanical wear (abrasion) on coastlines, producing a wide variety of morphologies including monoliths and different types of caves.*

40. *Tropical mountain forest growing on the flanks of Mt. Ruwenzori, a great igneous mountain at the border between Zaire and Uganda (equatorial Africa), where the humidity is high and the temperature changes with altitude. In contrast to the typical low-elevation equatorial forest, this results in a gradual decrease in the size of individual trees and an increase in epiphytic species, as the picture clearly shows.*

41. *Giraffes and zebras in the Masai Amboseli Game Reserve in Kenya (equatorial Africa). The environment in which the large African animals live and flourish consists principally of savanna, an open plant community of tall grasses generally accompanied by scattered shrubs and isolated trees (acacias and baobabs). Most of the grass cover is made up of* Graminaceae *species.*

42. *Sand dunes in Death Valley, California. Deserts like the one shown here exist not only in tropical latitudes but also in temperate zones, wherever precipitation becomes extremely sparse (less than 10 in. [250 mm] annually). The accumulations of sand were created as wind stripped detrital material from rocks (corrasion) and then transported it (deflation).*

43. *A mixed broadleaf and conifer forest on King Mountain in the Canadian province of Ontario, containing white cedar, larch, sugar maple, and birch. This is the typical "Laurentian" forest that thrives in continental conditions with relatively abundant precipitation (more than 40 in. [1000 mm] per year), and soils consisting of river and glacial deposits.*

44. *A herd of bison grazing in a North American meadow in the Great Plains region, an environment with semi-continental characteristics and only moderate precipitation (less than 40 in. [1000 mm] per year). Once very widespread, the bison was almost wiped out by overhunting in the 19th century and is now*

a protected species.

45. *Reindeer in a typical sub-Arctic tundra landscape in the Finnmark region (northern Norway) near North Cape. The tundra, devoid of trees but with a rich flora of mosses and lichens, flowers only during the brief summer, since the subsoil is permanently frozen.*

46. *Polar landscape with a polar bear (Greenland). This environment, particularly hostile to human settlement because of its prohibitive temperatures, is nevertheless propitious for several animal species, protected by their thick fur and accumulations of subcutaneous fat; these include the polar bear, whose diet consists predominantly of fish and seals.*

47. Homo sapiens, *a creature characterized by an upright stature and enormous brain development, represents the last phase in the evolutionary process of the human species over millions of years. Recent discoveries of australopithecines document the evolution of the primates most like humans. They had already achieved a fairly erect stance that allowed them to use their hands for support and also to handle rudimentary weapons and tools. One of the most ancient australopithecines found is "Lucy," whose skeleton was discovered in 1974 in the Afar depression in the Hadar river basin of Ethiopia. Lucy is believed to be about 3 million years old, and to have lived in an open environment with an only partially carnivorous diet; she is assumed to have been female due to her pelvic anatomy, height (3 ft [1 m]) and weight (55 lb [25 kg]). Later evolutionary phases were* Homo habilis, Homo erectus, *and lastly* Homo sapiens.

48. *The paintings in the caves of Lascaux in France, dating from the Magdalenian period (11,000–15,000 years ago), depicting scenes of hunting and daily life, as well as natural motifs and other symbols that are not readily decipherable, demonstrate that humans of the upper Paleolithic had a system of beliefs and a way of life that was already highly developed, including the production of knives, spears, and other everyday utensils from bone, ivory, and horn, along with flint tools.*

49. *Some very interesting evidence about the evolution of human lifestyles between the 8th and 6th millennia B.C. is provided by the rock engravings at Cape di Ponte in Val Camonica, northern Italy, now protected by a nature park. The ancient inhabitants of this area, the Camuni, recorded in the rocks the transition from a hunting-based economy to one based on agriculture, with domesticated crops and animals: a radical change in relations between humans and nature, and among humans in society.*

50. *The culture that flourished in the Eolian Islands off northern Sicily in the middle Bronze Age (approximately 1400- 1270 B.C.), referred to as the "Milazzo culture," is documented by the settlement and objects found at Panarea. The strategic location of this village and the finds recovered during excavations are evidence that commercial exchanges took place by sea with other Italic populations and with the Mediterranean as a whole, and indicate the advanced society that had been developed by the inhabitants of these islands.*

51. *The caves of Balzi Rossi near Ventimiglia, on the Mediterranean coast near the border between France and Italy, are located in cliffs above the sea and represent one of the most famous Paleolithic sites in Europe. Excavations have revealed tombs with human remains belonging to a prehistoric race with Negroid traits, called the "Grimaldi" people. Graffiti and numerous small female statuettes indicate a highly developed culture.*

52. *A group of Dutch girls at a traditional festival. The amazing variety of physical traits among humans is the result of genetic selection mechanisms during the evolution of our species, as well as environmental factors. Geographic barriers (rivers, seas, mountains, or deserts), separating different ethnic groups for thousands of years, have promoted isolation.*

53. *The term "race" as applied to the human species is a difficult and controversial one, since there are no universally accepted scientific criteria. To facilitate research, however, humans are usually divided into groups based on morphological resemblances: skin color (dark, yellow, white), skull shape (brachycephalic, dolichocephalic, mesocephalic), eye color and shape, and so on. The Indians of Rajasthan, like the woman shown here, are assigned to the Caucasoid branch.*

54. *The human species is sometimes divided into four principal branches (Negroid, Australoid, Mongoloid, Caucasoid) and into several derivative races. The various groups are highly differentiated, especially among the populations of Asia and the Americas. This young Malay belongs to the Mongoloid branch.*

55. *Nigeria is the most densely populated nation in Africa, and its highly diverse population is divided into a number of groups—Ibo, Hausa, Yoruba, Fulbe, and others—which generally belong to the Negroid race, characterized primarily by dark brown or black skin color, curly black hair, dark eyes, and a slender body of variable stature.*

56. *The Berbers, like the girls shown in this photograph, are a group of Caucasoid peoples of northern Africa, of mixed autochthonous, European, and Asian descent. Except among the Tuaregs, nomadism is not very common among these groups, which consist for the most part of farmers or herders, living in the countries of the African Mediterranean littoral and in the Sahel.*

57. *At the time of the European discovery of America, the Amerinds (a term commonly used to designate the innumerable populations of the New World) were relatively homogeneous in physical terms, with predominantly Mongoloid characteristics indicating their Asian origin. Specific traits varied based on the particular ethnic group. With the European conquest, however, decimation of the native populations, imposition of European culture, and miscegenation gradually modified the physical and cultural characteristics of these peoples. The original* Indios, *like the Yanomami of Brazil shown here, are now found only in the depths of the equatorial forests.*

58. *The Industrial Revolution of the 19th century rapidly and radically changed the world: the population increased, people migrated in unprecedented numbers from the countryside to the city, and living standards rose. The result was to disrupt centuries-old environmental and social equilibriums. The abnormal growth of urban centers (like London, where this photograph was taken), whose populations increased in a matter of decades from a few hundred thousand to several million, has created critical situations. Ecological anxiety, traffic, noise, pollution, environmental degradation, crime, and drugs are all urban ills.*

59. *Social unrest is being provoked, among other factors, by rapid economic development which tends to magnify social differences and create environmental problems. The phenomenon, which began with the expansion of the cities, was not given proper attention until social tensions and demographic problems exploded into obvious paradoxes. In developing countries in particular, as in this section of Calcutta, modern buildings are spreading out to envelop and finally destroy traditional structures.*

60. *Since antiquity, the desire to hold onto their achievements has led humans to invent communications codes to transmit acquired experience and pass it on to later generations. In more developed countries attendance at school, whether public or private, is mandatory up to a certain age, and schools use modern teaching tools and methods. The photograph shows a classroom in Great Britain.*

61. *A schoolroom in Nepal. In poor countries with underdeveloped economies, where the illiteracy rate is high, education of adults as well as children is of concern and the purpose and methods of teaching can be quite different from those in rich countries.*

62. *Mass being celebrated at Killarney in Ireland. The roots of human religious sentiment go back to the very dawn of civilization. Religious beliefs and ritual acts have in turn influenced artistic and literary expression, and the history and culture of the world's many peoples. The largest religious persuasion in the world is Catholicism, which originated at the time of Christ and has since spread throughout the world.*

63. *In the early part of the 16th century in Germany, a great popular protest movement against the decadence of the Catholic church and the corruption of its clergy gave rise to a genuine religious revolution, from which Protestantism arose. In the societies in which it took root, its principal forms—Lutheran, Calvinist, Anglican—have produced a change in outlook not only on religion, but also on society, economics, and politics, that has profoundly influenced the events of the last few centuries. The spare and frugal Protestant spirit is often reflected in the furnishing of its places of worship, like the one shown here.*

64. *A collective funeral in Moscow. The term "Orthodox church" generally refers to all the Byzantine-rite Christian churches that split off from Rome in 1054 and are headed by the patriarch of Constantinople. The liturgy of the Orthodox church, celebrated in a variety of languages, is very lavish, with great importance given to chant, vestments, and sacred images (icons).*

65. *Since the Hellenistic period, the term "Jews" or "Hebrews" has been applied to the populations that occupied Palestine in the 2nd millennium B.C. and formed a national unit based on monotheistic religious tenets, unlike all the other peoples of that era who were polytheistic. Despite having been scattered throughout the world by religious and racial persecution, the Jews have remained united for thousands of years through their religion. The photograph shows the Wailing Wall in Jerusalem, 157 ft [48 m] long, a structure still regarded as holy by Jews who believe it was constructed of great monolithic blocks from the Temple of Solomon. On Saturdays and holidays believers come here to pray and to bemoan the fall of Jerusalem.*

66. *Islam, founded by Muhammad in the 7th century, touches every aspect of life, based on an absolute monotheism in which divine law dominates everything. There are two principal Islamic confessions: Sunni (the majority), which is centered in present-day Saudi Arabia, and Shiite, of which Iran is the greatest population center and driving force. Islam is widespread today in large parts of Asia and Africa. The photograph shows a scene from Friday prayers at the Sultan mosque in Singapore.*

67. *The doctrine of salvation preached by the Buddha (whose effigy can be seen in the background of this photograph of monks praying at a temple in Bangkok) and by his disciples starting in 486 B.C., in India and later throughout the East, has profoundly influenced art, culture, and social systems in every country in which it has flourished. Buddhism's unique concept of existence as an uninterrupted chain of lives, and of human passions as a source of suffering, inevitably generates a tendency toward detachment from everything earthly. Salvation thus consists in "extinction" or "nirvana," which is achieved by following the Eightfold Path of righteousness.*

68. *The world's agricultural production is characterized by rigidly defined production cycles linked to soil and climate, and by a strong differentiation in cultivated lands. The economy of Sri Lanka, an island nation in the Indian Ocean southeast of India, is predominantly agricultural, based both on subsistence products such as rice, and on cash crops including tea, sugar cane, and rubber, grown for export. The photograph shows terraced rice paddies.*

69. *In the livestock business as in every other agricultural sector, increased productivity depends above all on technological and organizational innovations. Both can be achieved in large-scale operations, although they tend to squeeze out smaller businesses and drastically reduce employment, creating serious labor imbalances.*

70. *A textile dye works in Morocco. With the spread of industrialization, there has been a gradual decline in the production of goods, often of artistic value, resulting from manual labor or the use of simple machinery. Conversely, and in apparent contradiction, there has been an increasing interest in material culture expressed in the creation of museums dedicated to crafts, peasant life, fishing, and folk traditions. In more developed countries, there has also been a proliferation of crafts courses. Another contradiction exists in economic terms: in underdeveloped countries craft production is underpaid, yet it is extremely expensive in rich countries.*

71. *Rising demand for metallurgical products has led to intensive exploitation of ore deposits and has had a severe environmental impact, as demonstrated by this "open-pit" mine in South Africa where ores are extracted directly from the ground without underground tunnels to reach the metal-bearing veins. Particularly with the advent of new extraction technologies, mining activity has often changed the surrounding socioeconomic environment as well, with the creation of urban settlements for workers, construction of infrastructures, and a rise in living standards.*

72. *Oil wells in Texas. Especially in the first part of the 20th century, low cost and ease of extraction, use, and transportation have made oil one of the key factors in world development. Decelerating economic growth in industrialized countries, the problem of atmospheric pollution, and a search for alternative energy sources have nevertheless recently led to a decline in consumption and drilling; the resulting economic stresses have affected the entire world, ultimately having a negative effect on producing countries.*

73. *Modern technology, which is part of all industrial processing, is changing (and in some cases has already changed) both the quality and quantity of products coming to market, as well as the mentality of industrial workers and consumers. For example, a suit of clothes or bolt of cloth was once a precious, durable, and extremely costly item in terms of both production and acquisition; today, market competition is forcing producers to continuously update their product lines to meet consumers' needs and increase sales.*

74. *The automotive sector was one of the first industries to introduce both computers and robots into the production process. New production methods, which initially created great stresses for both individuals (because of psy-*

chological difficulties) and the labor force as a whole (as numbers of employees decreased), are rapidly spreading throughout the world and into every industry, allowing increased production and a substantial decrease in product cost.

75. *Computers are now a familiar feature in the workplace and in educational environments as well. In developed countries, information-processing equipment can also be acquired by the general public, at low cost and at ordinary retail outlets. The increasingly intimate linkage between computers and modern telecommunications systems is profoundly changing modern mentalities, with social, economic, and cultural repercussions whose effect is still difficult to assess.*

76. *Containers—large boxes constructed with internationally standardized dimensions and capable of transporting any kind of product—are now commonly used to facilitate cargo movement. This system simplifies all loading and unloading operations, transfer between transport means (train, truck, ship), and storage operations in rail, truck, or harbor warehousing facilities, like the one shown here. The advantages in terms of cost, practicality, and security are enormous.*

77. *A stretch of superhighway between Rome and Frosinone (Italy). The development of new communications systems and roads has profoundly changed the human landscape and economic structures over the centuries. Until a few decades ago, land routes were determined by the physical conditions of the terrain. Today, to handle enormous increases in traffic (primarily of motor vehicles), the communications system often affects the environment, modifying it for greater efficiency but often causing ecological damage.*

78. *The Japanese high-speed "Bullet Train" speeds past Mt. Fuji. Since 1825, when the first 21-mi [34-km] line was opened in Scotland, railways have been one of the fundamental elements in development and socioeconomic transformation around the world. Today planners are designing and implementing ultra-high speed trains and lines to meet competition from air and road transportation.*

79. *The first passenger flights were made in the United States between 1912 and 1914, and in 1919 the world's first passenger airline, KLM in the Netherlands, began intercontinental connections. After World War II, commercial air transportation began to challenge the dominance of railways and ocean liners. Aviation developed steadily until 1974, when increased fuel prices compelled airline restructuring, a reduction in administrative expenses, and the construction of larger aircraft with lower operating costs.*

80. *Since 1957, when the Soviet Union's Sputnik became the first artificial satellite launched into outer space, the number of objects placed into orbit around the Earth for various purposes has multiplied enormously. Telecommunications satellites (like Leasat shown in the photograph, used by the Space Shuttle in 1985) provide links between ground stations, transmitting telephone calls, data, and images in real time all over the world. Other satellites observe meteorological conditions (Meteosat), Earth resources (Geosat), and many other phenomena relating to the environment and human life.*

81. *The trading floor of the Paris Bourse. As an organized public securities market, where shares are sold or purchased only by authorized agents (stockbrokers), a stock exchange allows a large volume of interchanges to be concentrated into a limited space and time. The oldest of the world's major stock exchanges is in Amsterdam (1608); the most recent, but now one of the most important, is Tokyo's (1878).*

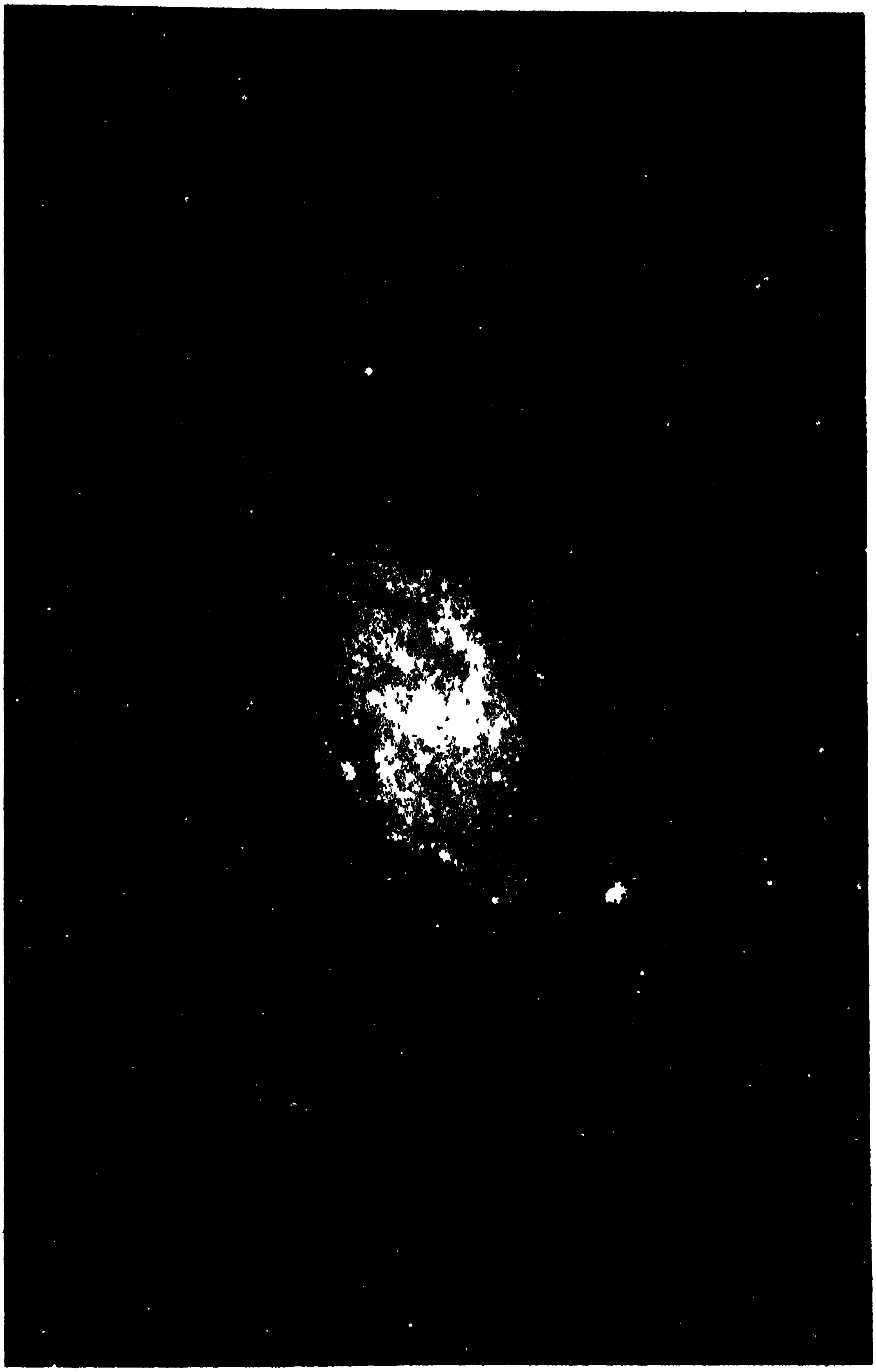
82. *New forms of distribution developed concurrently with the growth of heavy industry, and indeed as another product of the capitalist economy. Beginning in the mid-19th century in Paris (the photograph shows the interior of the* Galeries Lafayette*), there developed a system of sales outlets—department stores—which optimized the time and expense involved in distributing and marketing goods.*

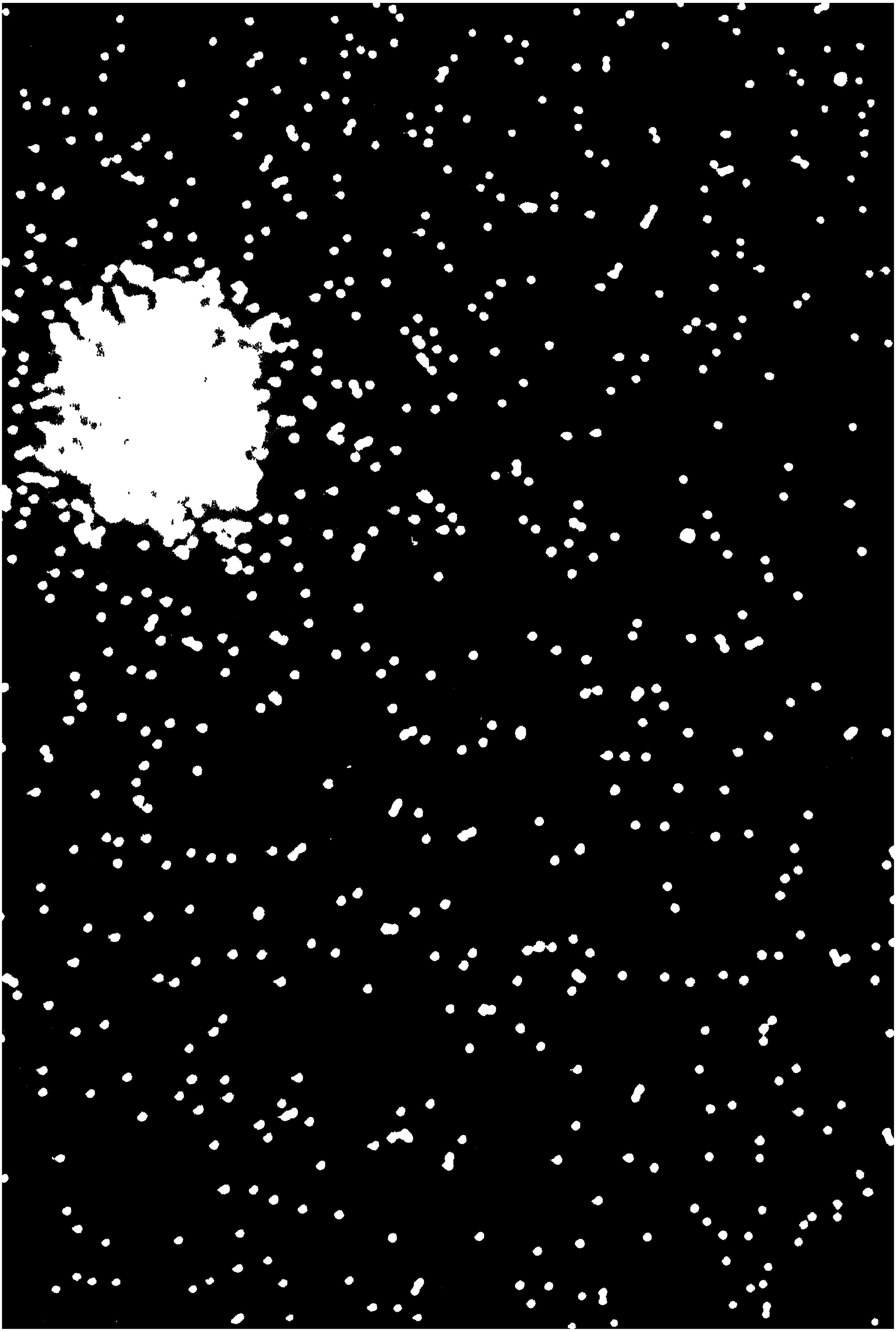
83. *The Industrial Revolution also changed the concept of eating, elevating the common dining room to a privileged social position as a meeting place for both business transactions and leisure time. The most recent development, "fast food"—more economical, more in step with the frenetic pace of the industrialized world, and more accessible to the general public—has produced a true revolution in social and eating habits, especially in the large cities of the developed world.*

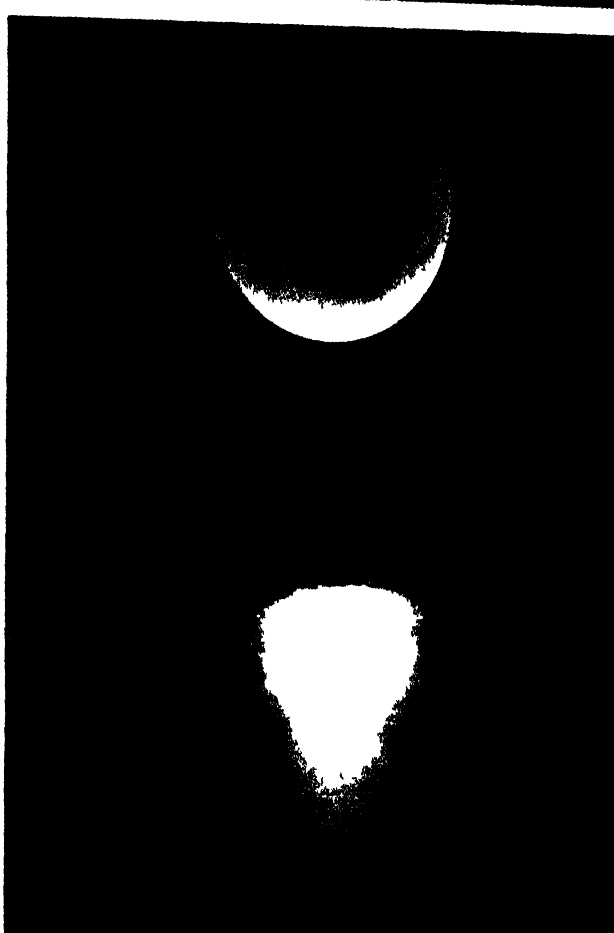
84. *"Garbage gulls" at a landfill. The consumer civilization inevitably brings with it the problem of disposing of the solid and liquid wastes produced by industry, agriculture, cities, and households—a problem that is still far from solved and is becoming increasingly acute. Even when recyclable materials such as glass, steel, and paper have been separated out, refuse dumps are not only reservoirs of infection, but also sources of solid and inert wastes. If burned, they generate combustion fumes containing highly toxic pollutant gases.*

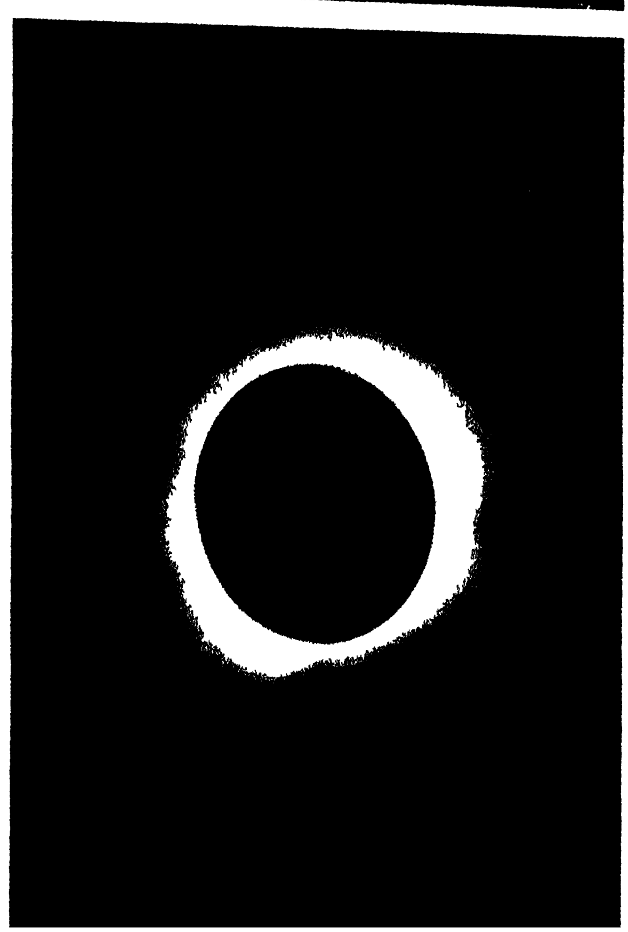
85. *Despite legal requirements, industrial processes often produce wastes containing highly polluting substances. These have occasionally resulted in pollution events like the recent spill into the Rhine, with dramatic effects on large and densely populated areas. The photograph shows industrial wastes discharged from a chemical factory in England.*

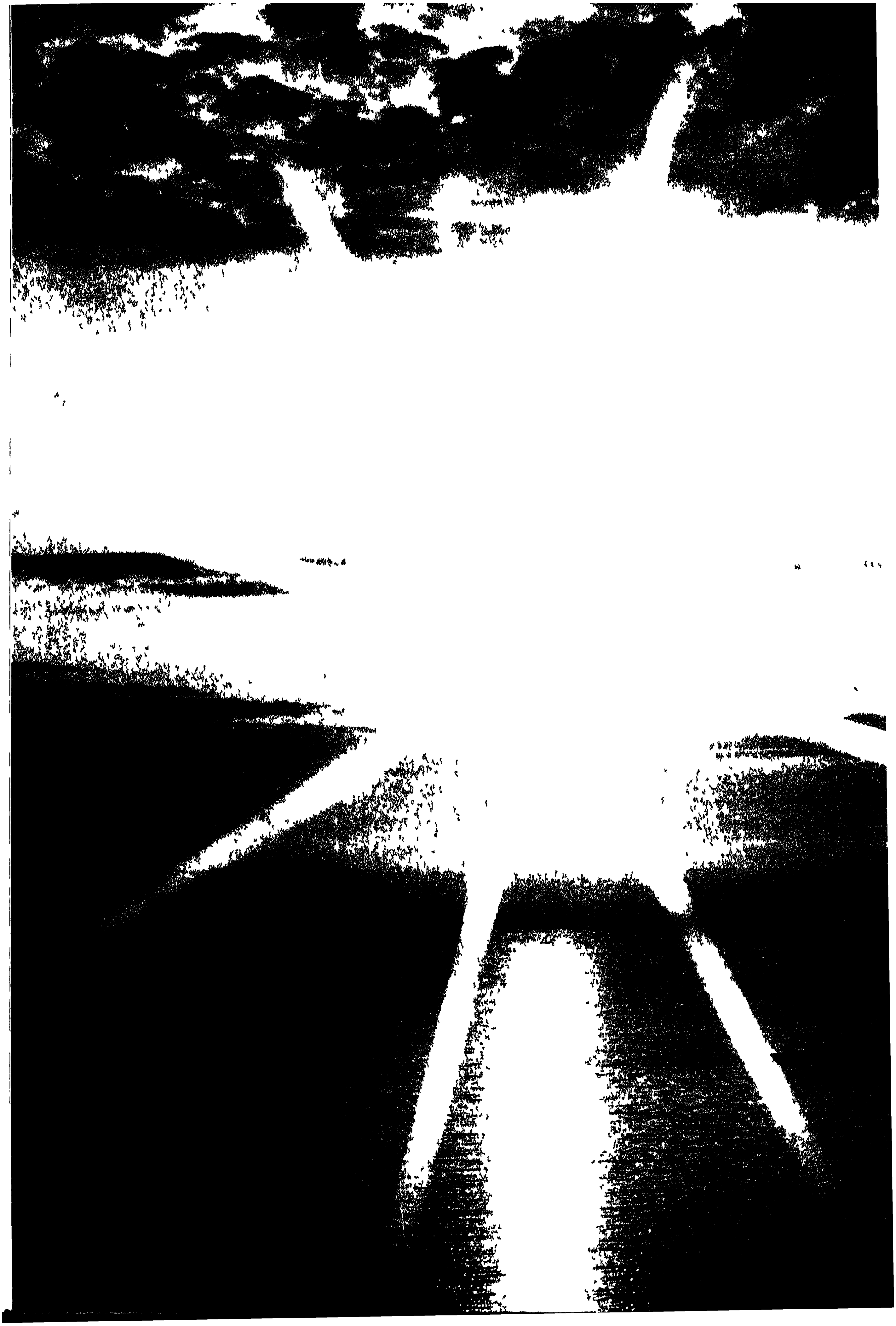
The Planet

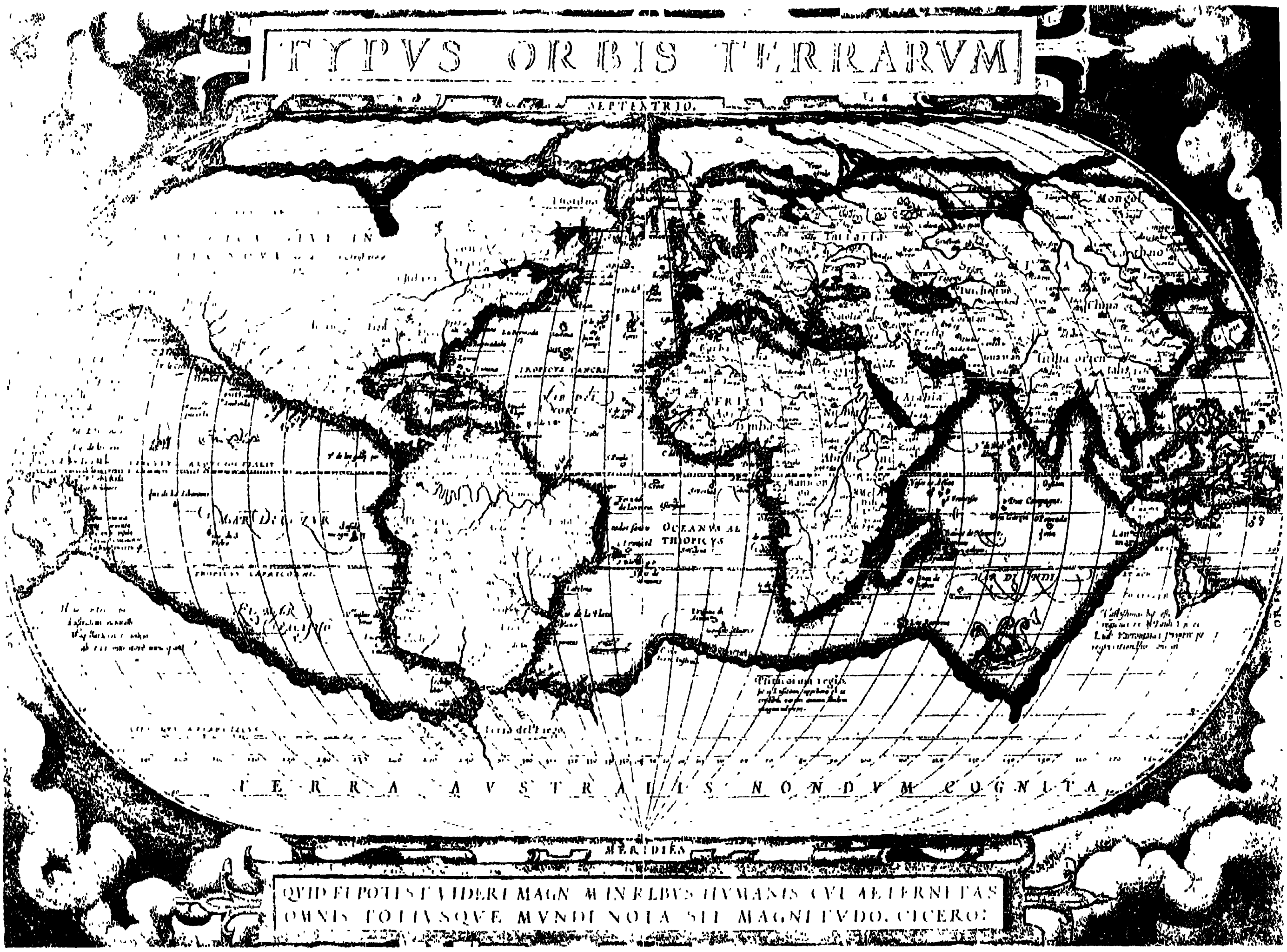








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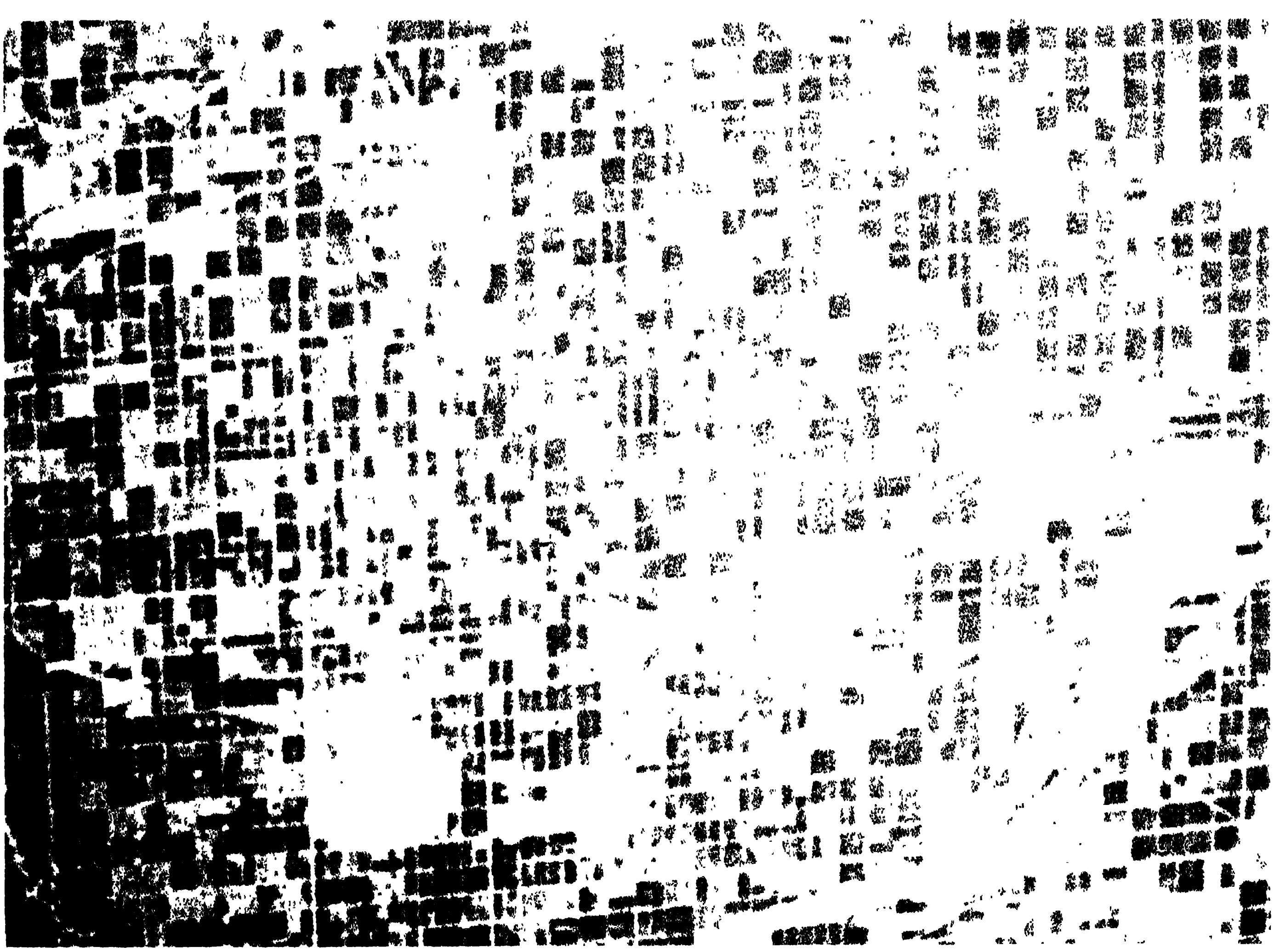

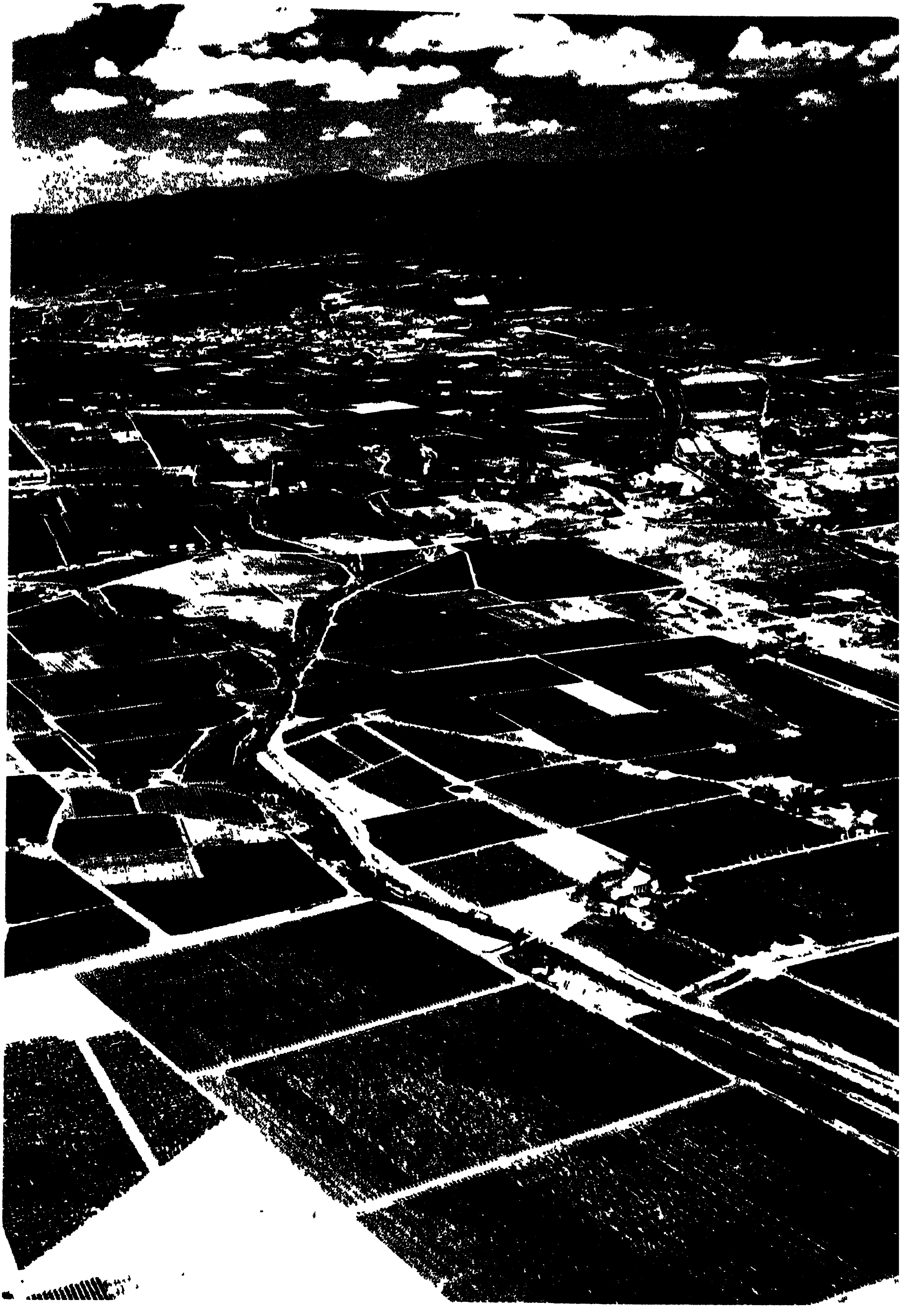

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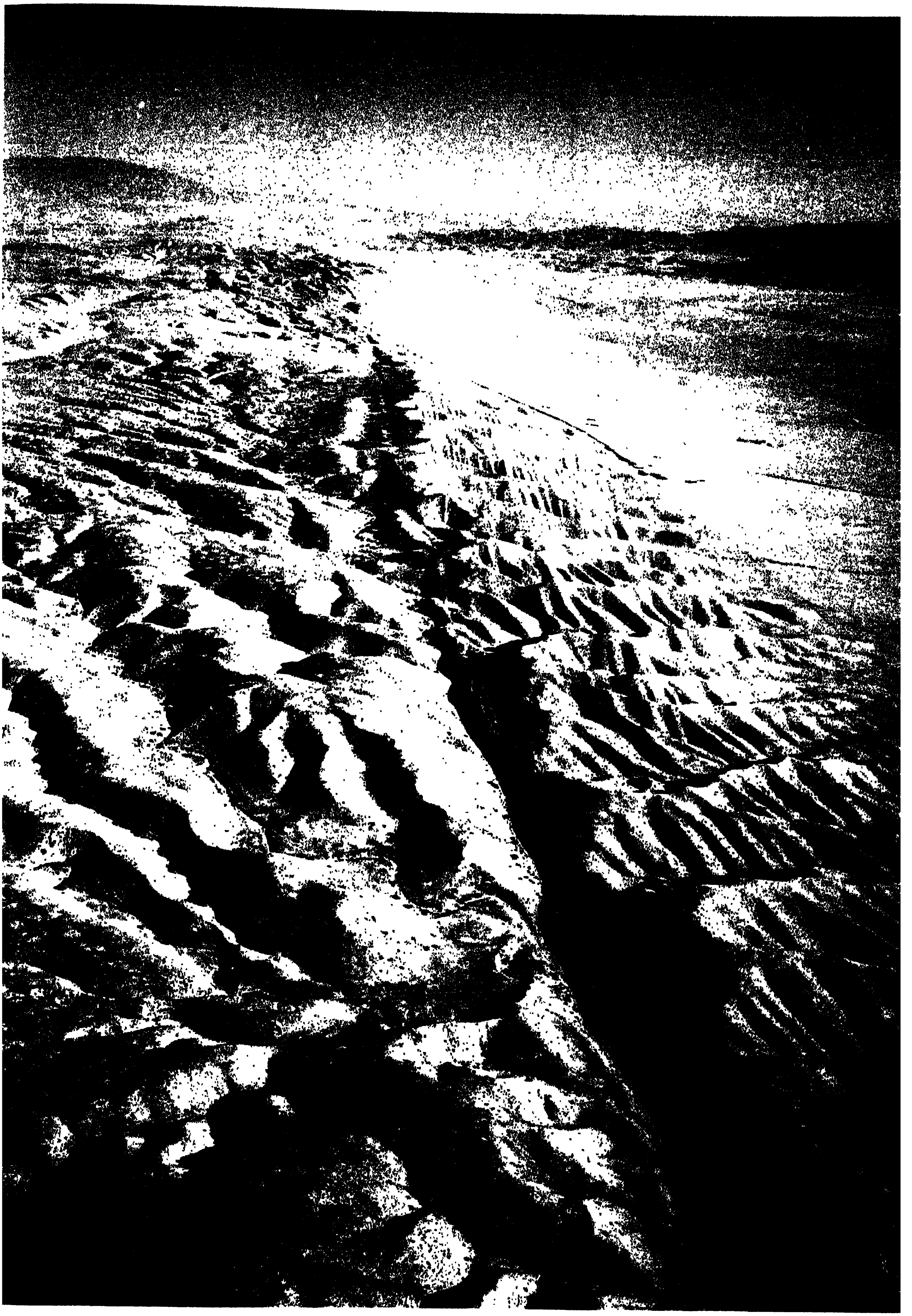

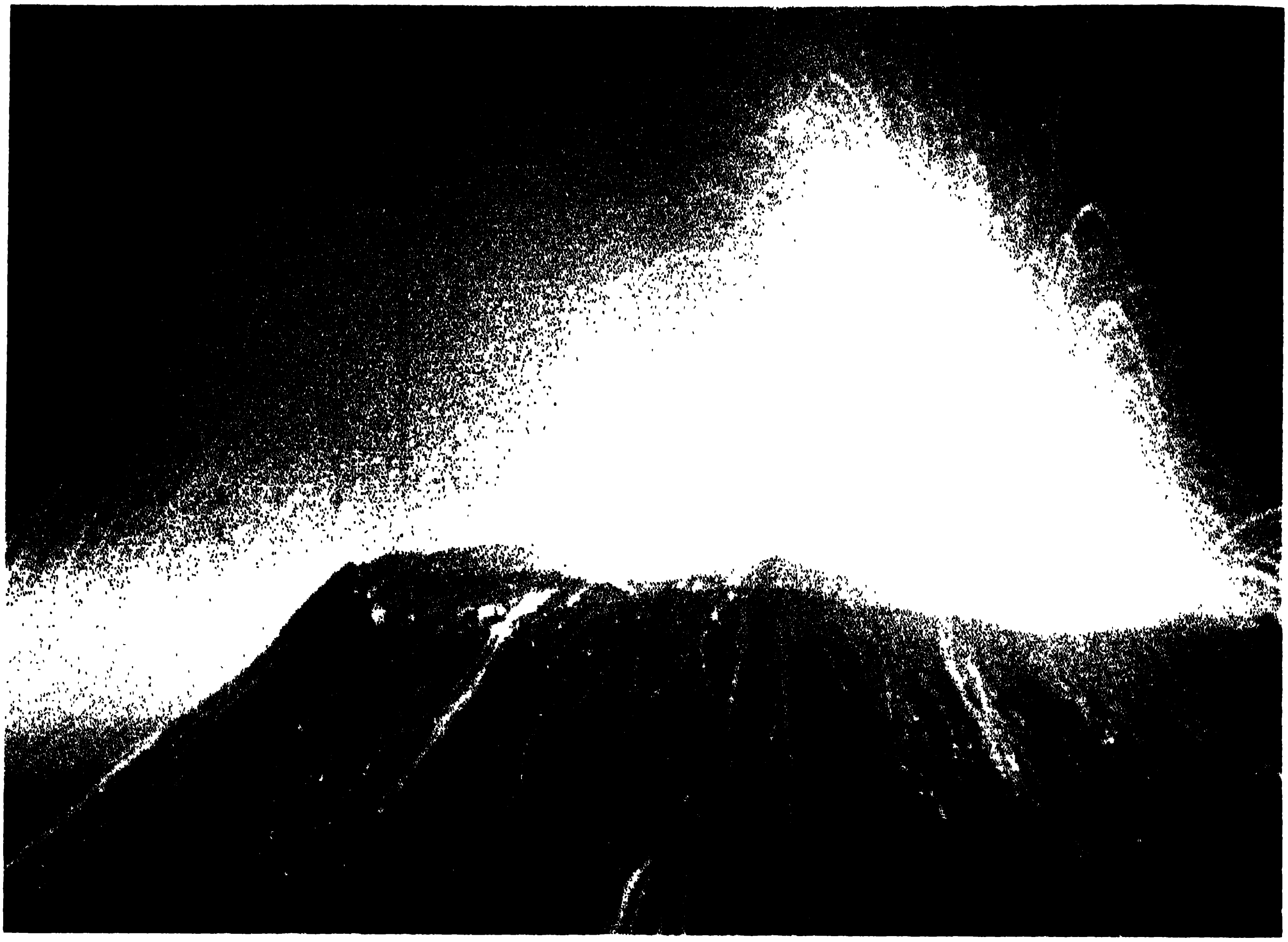

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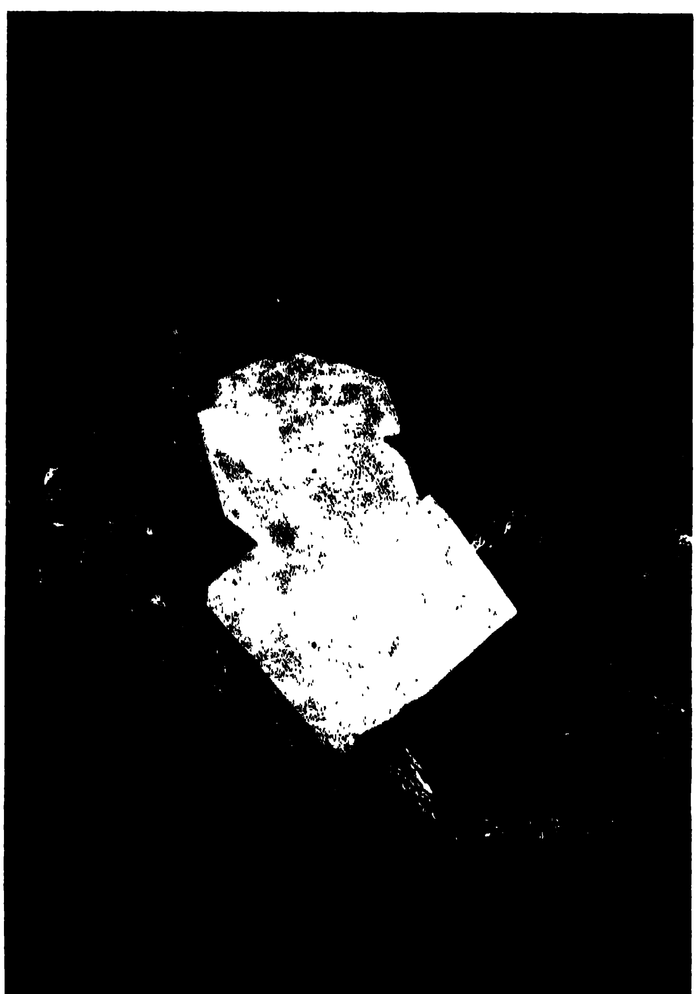

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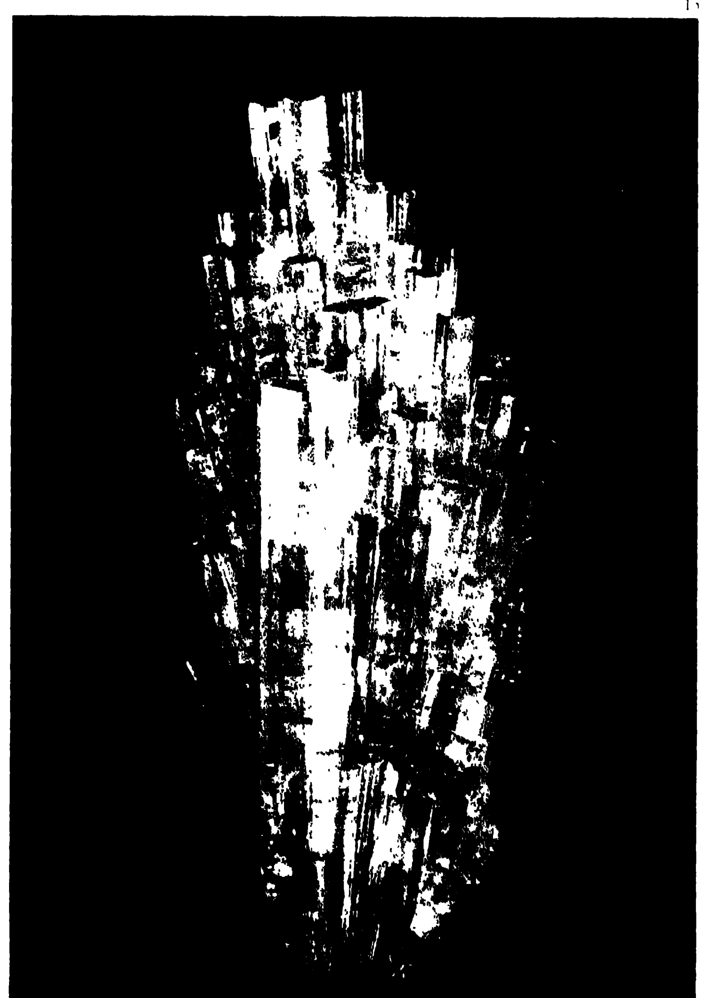

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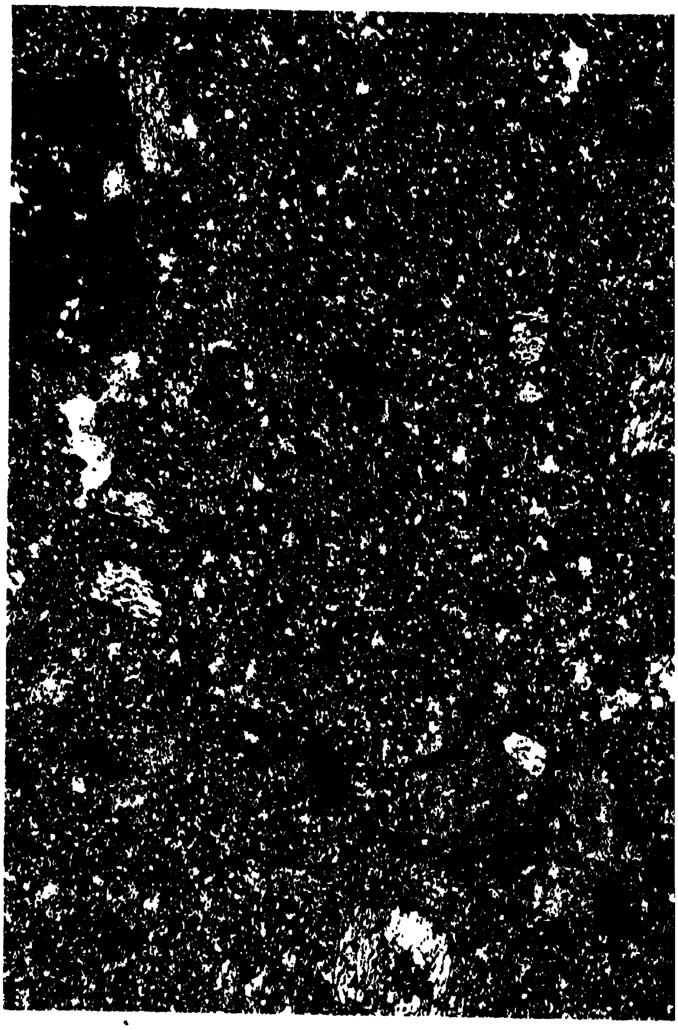

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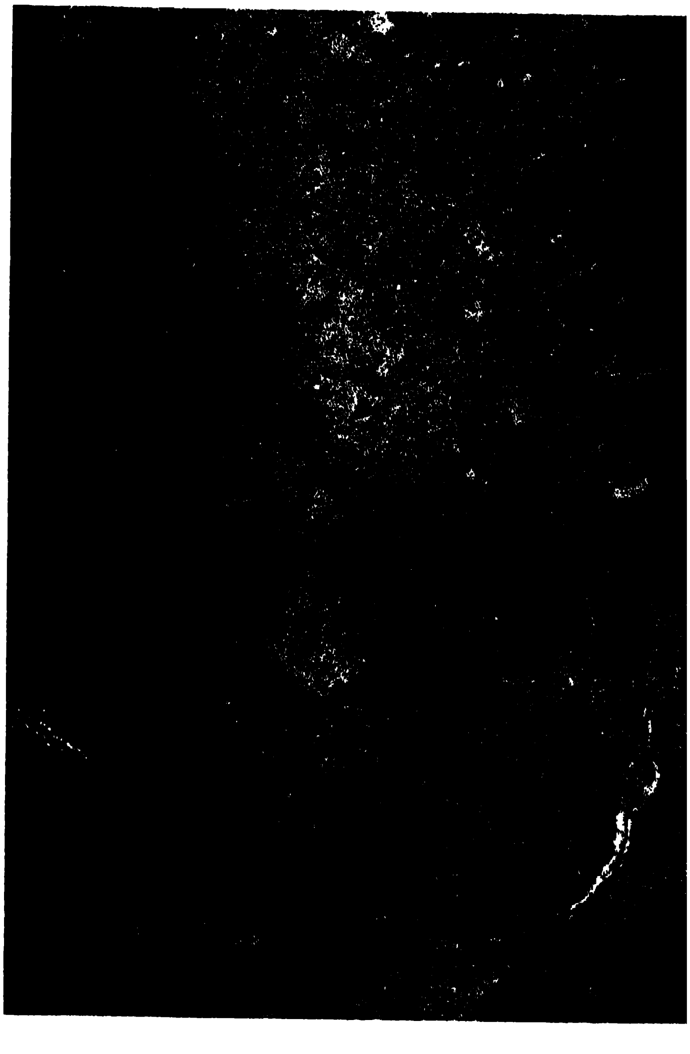
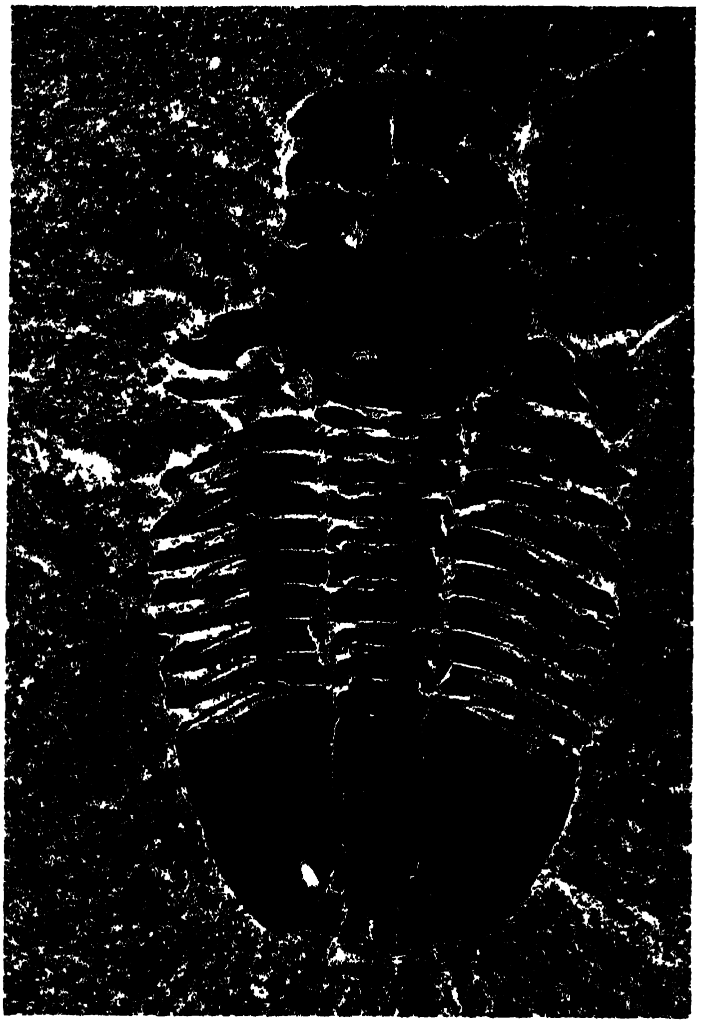
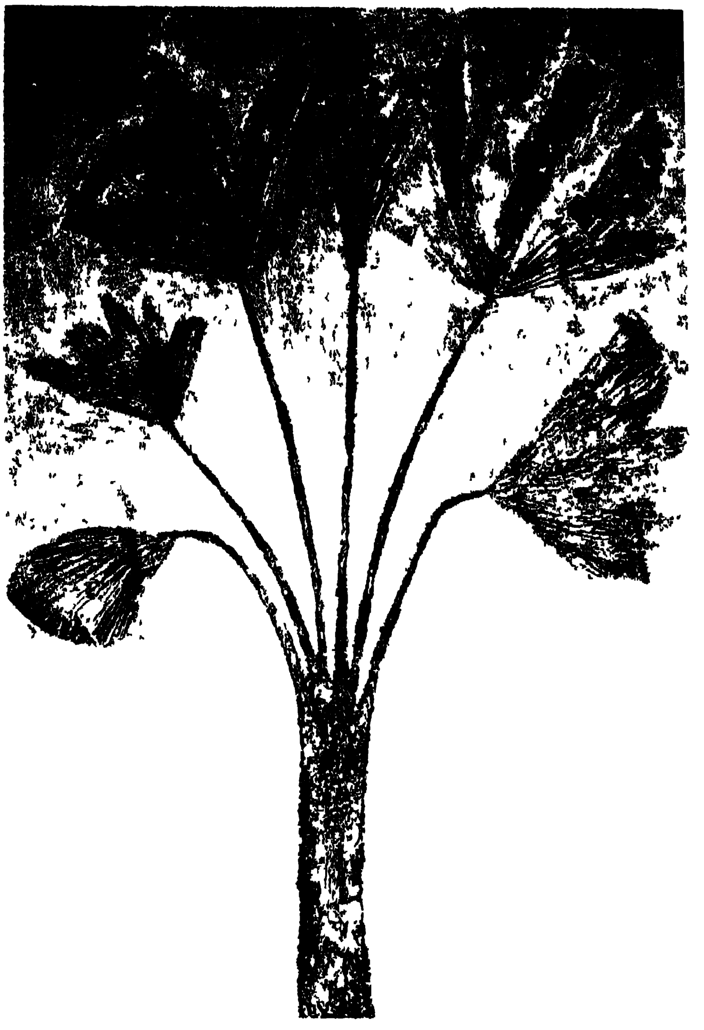
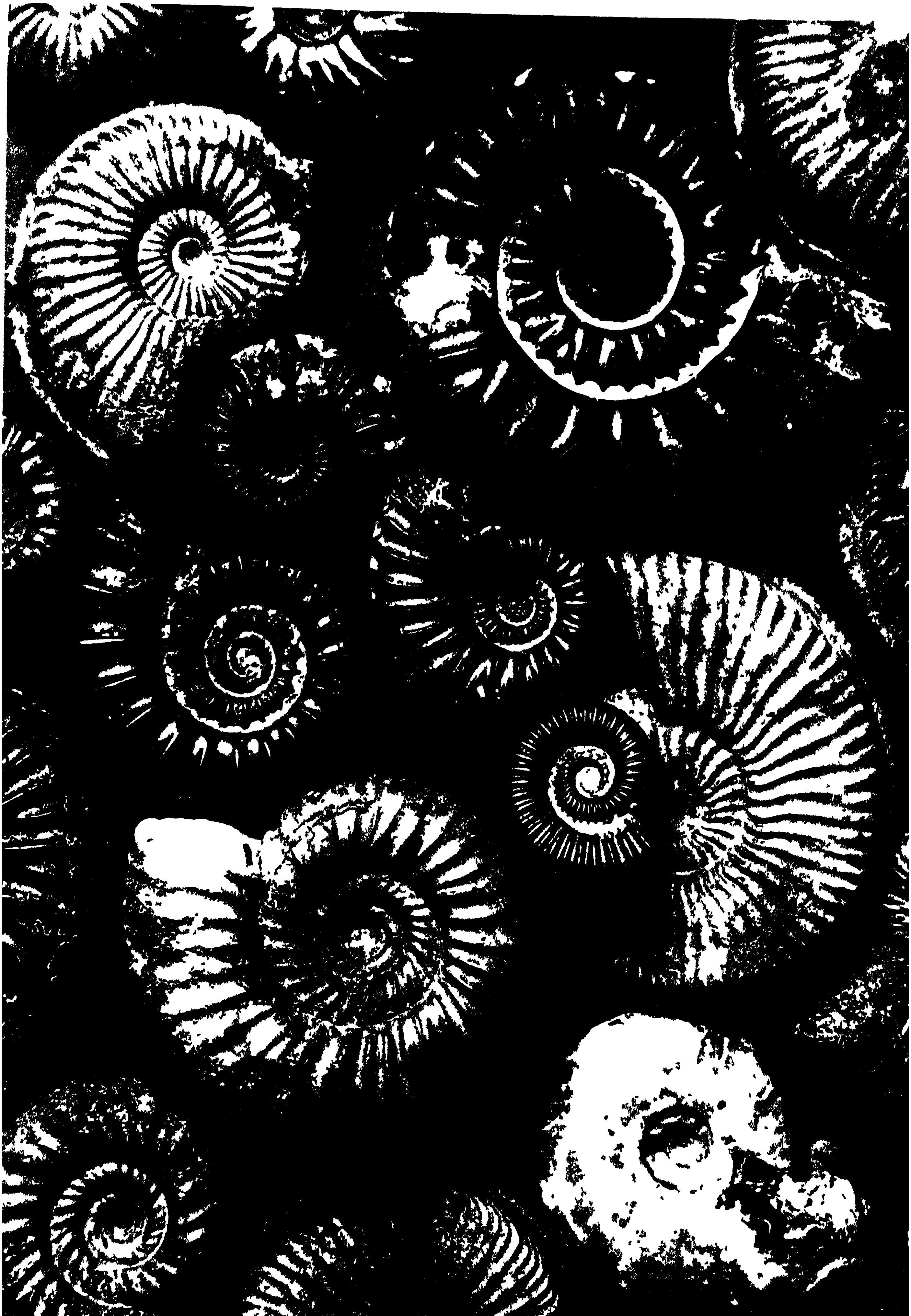
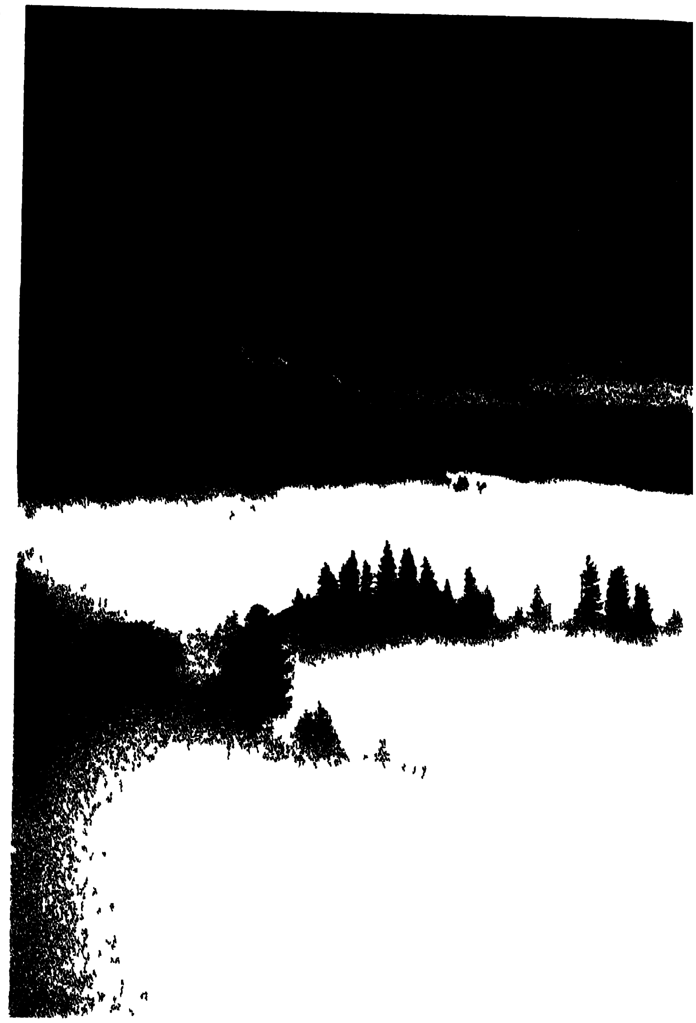
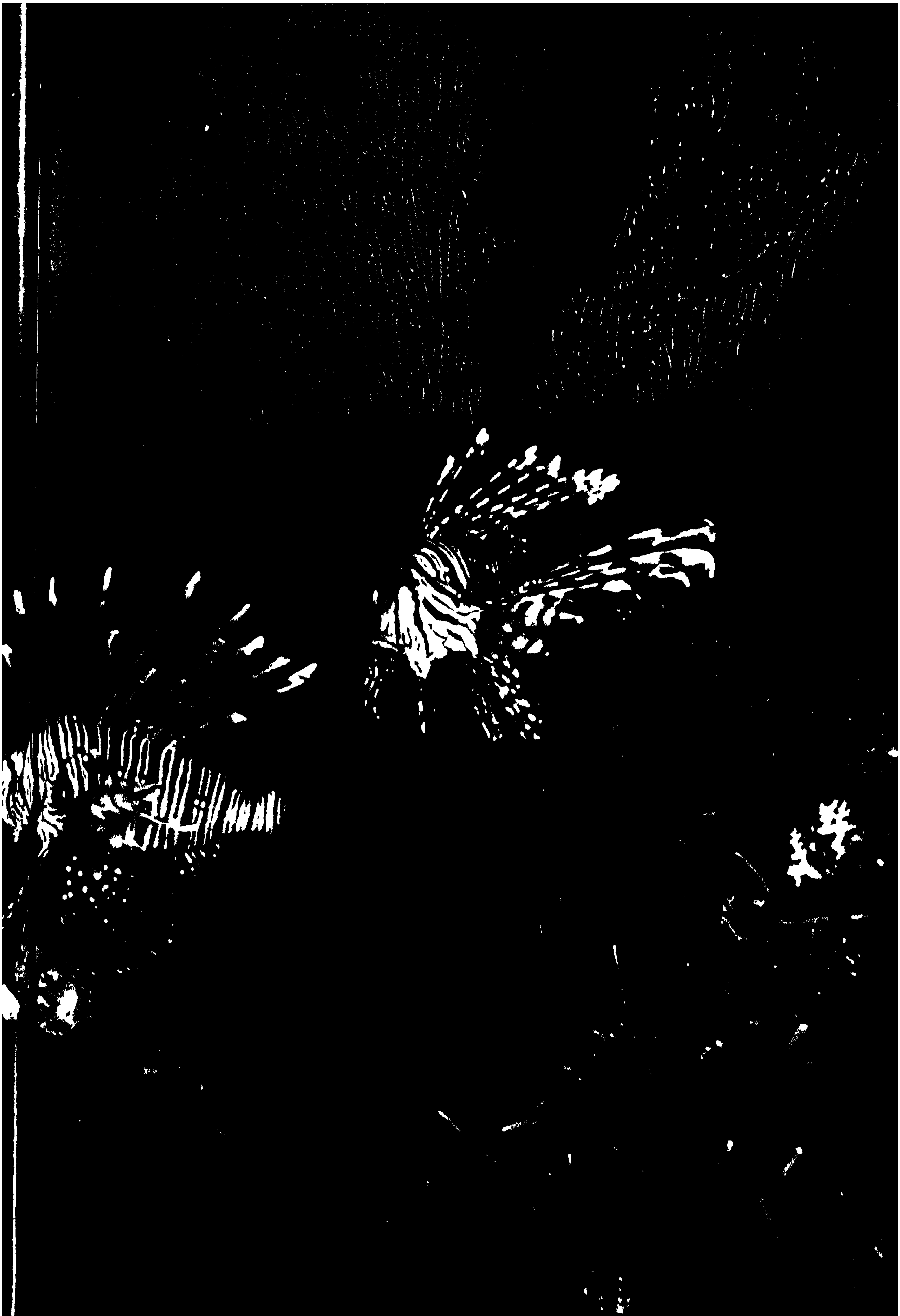


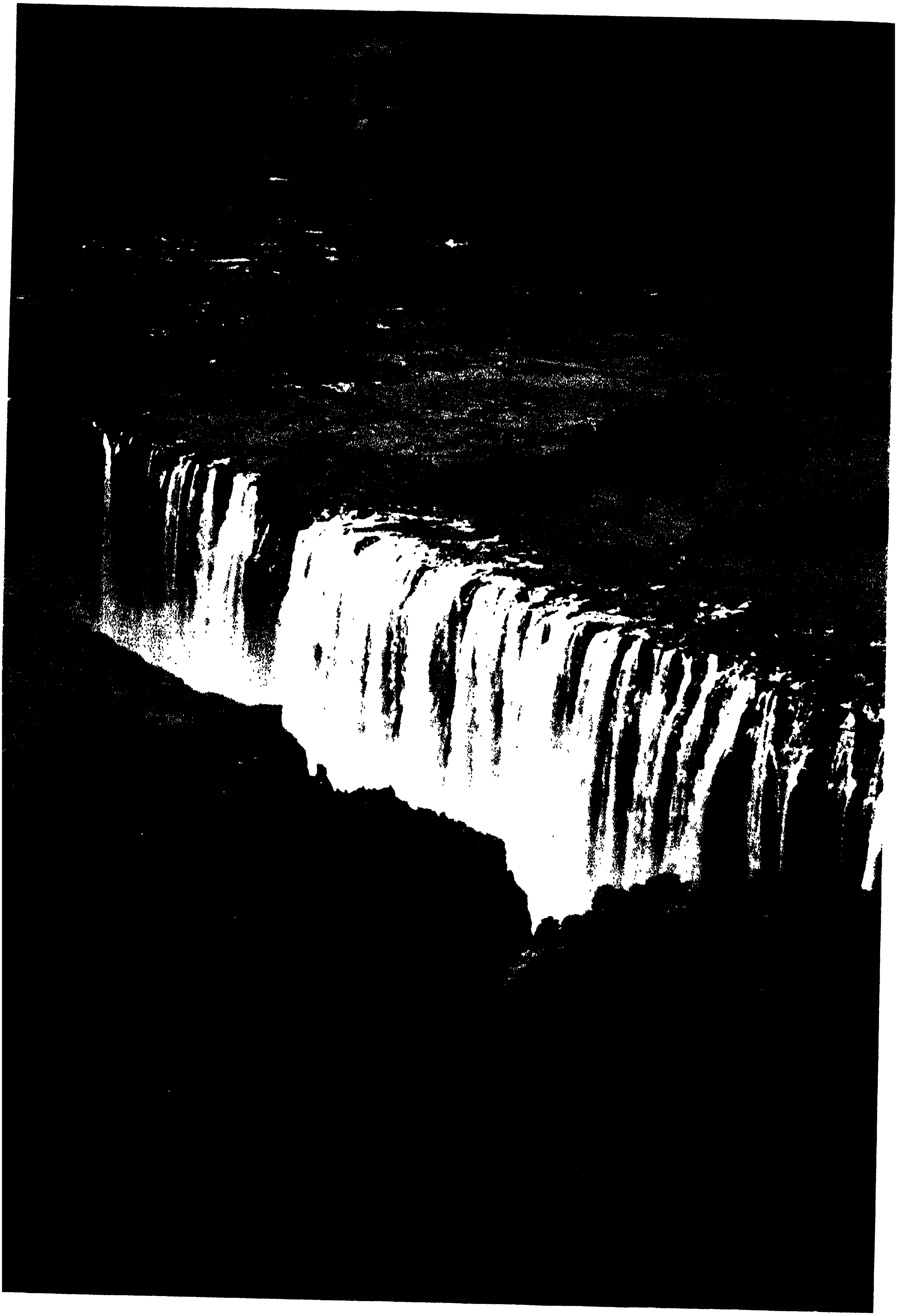


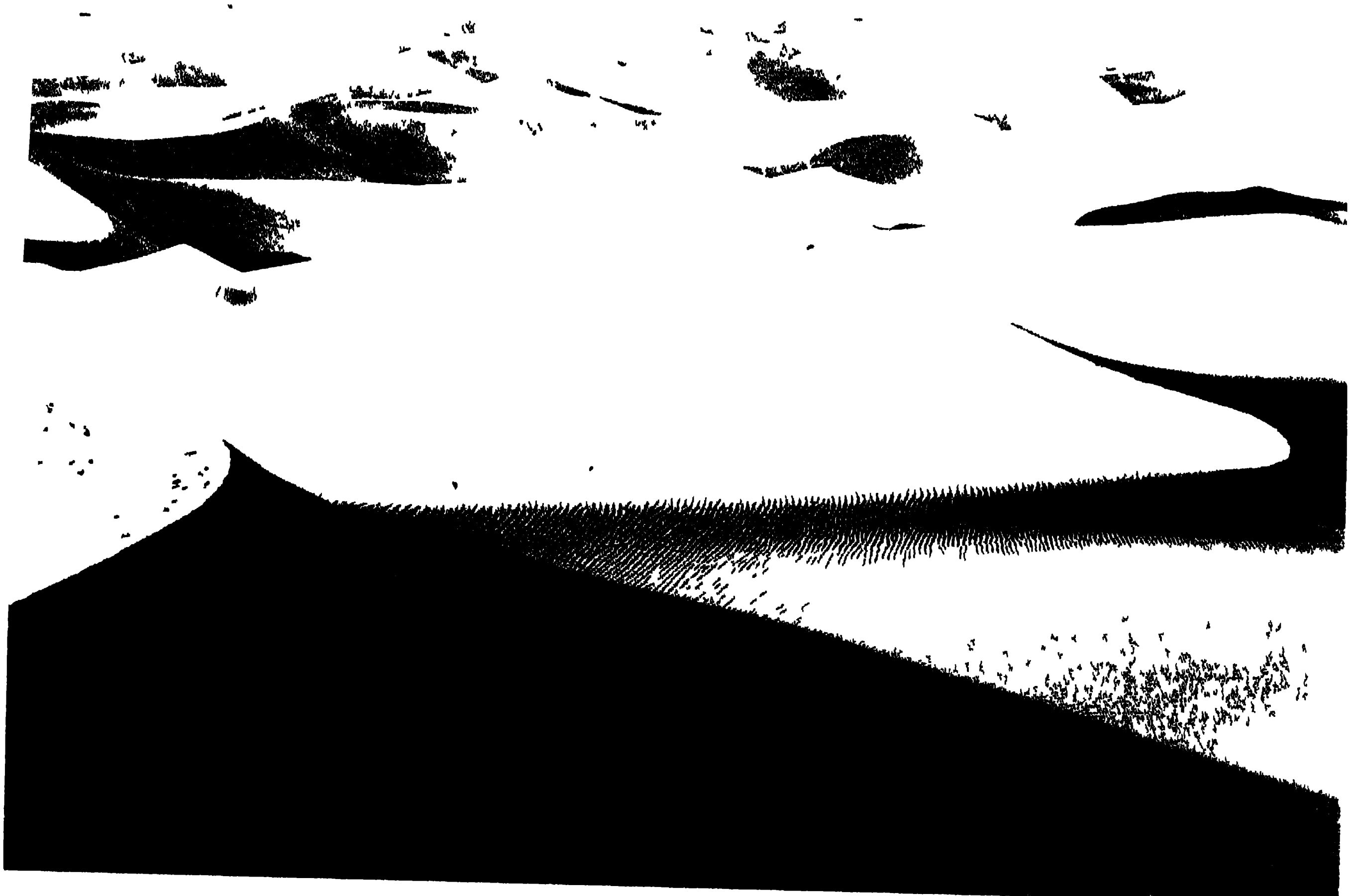


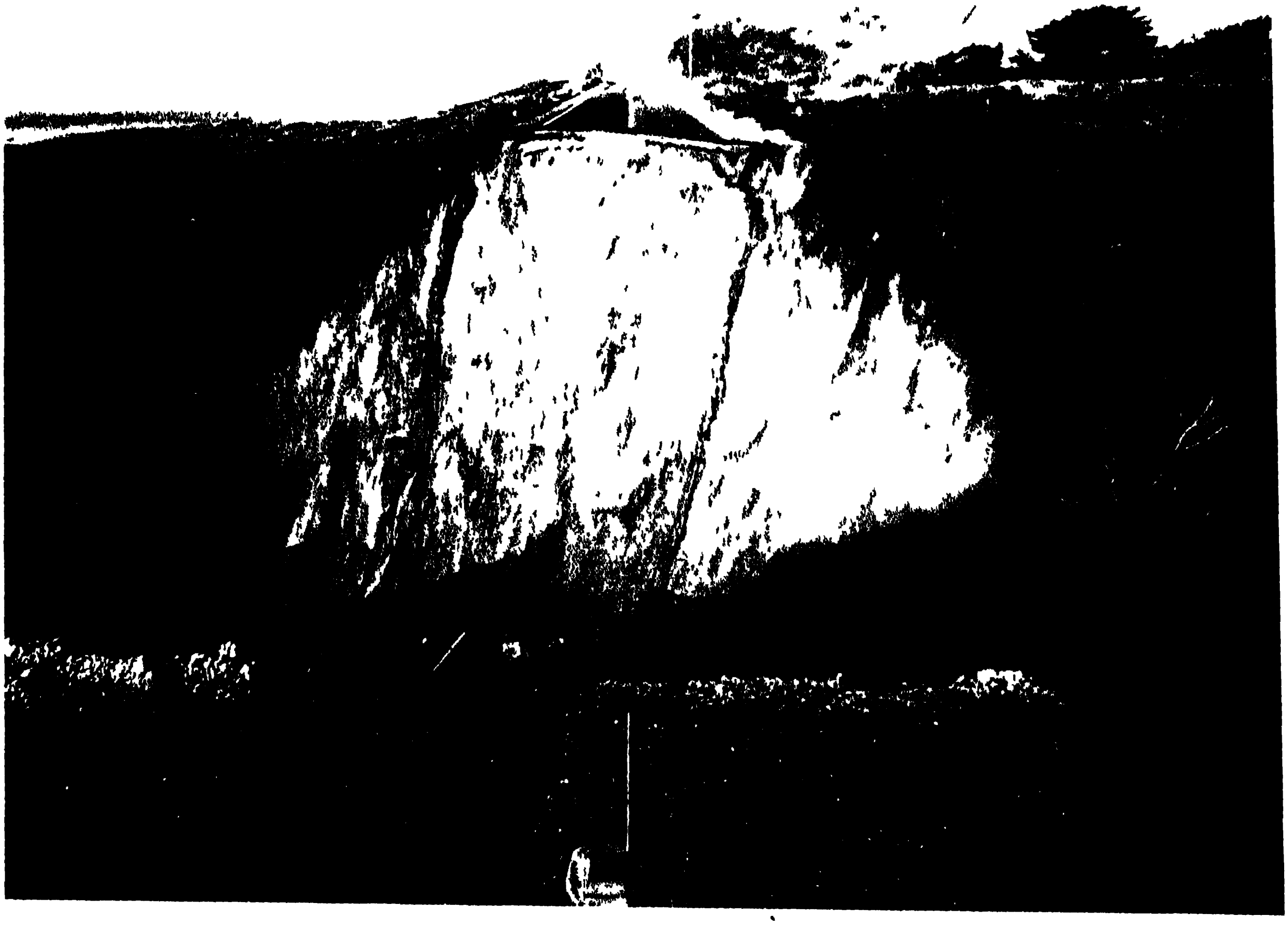


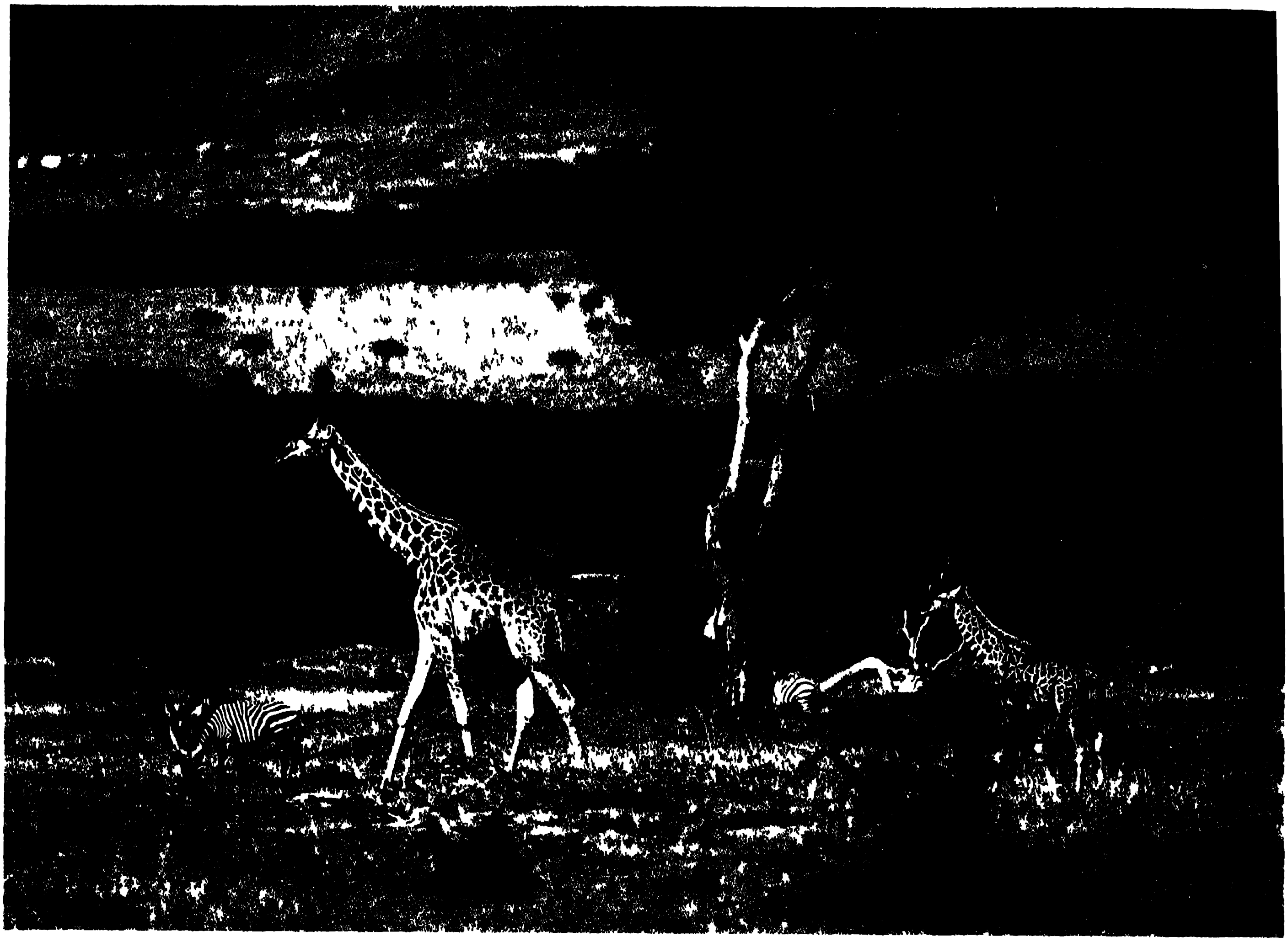


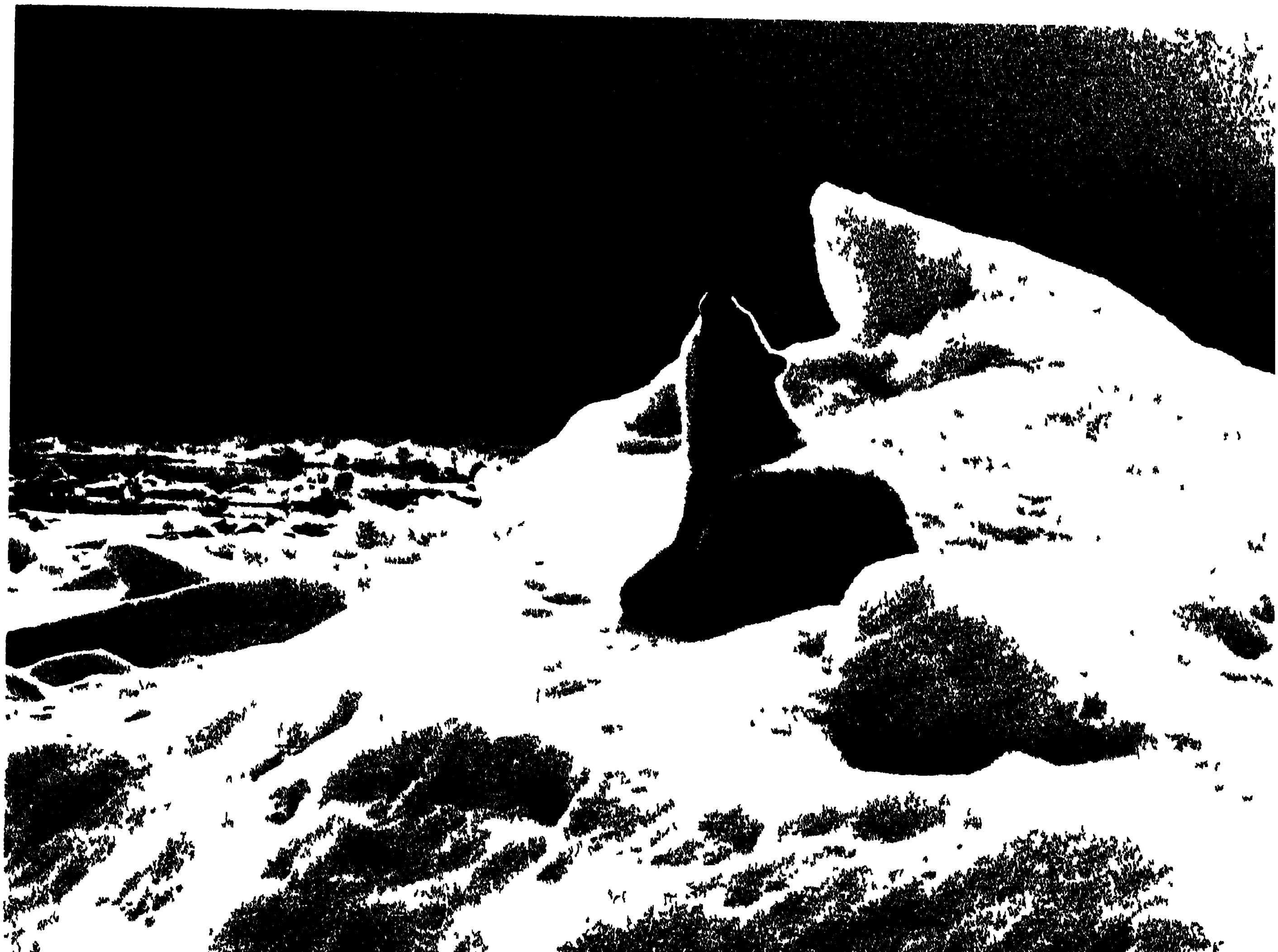




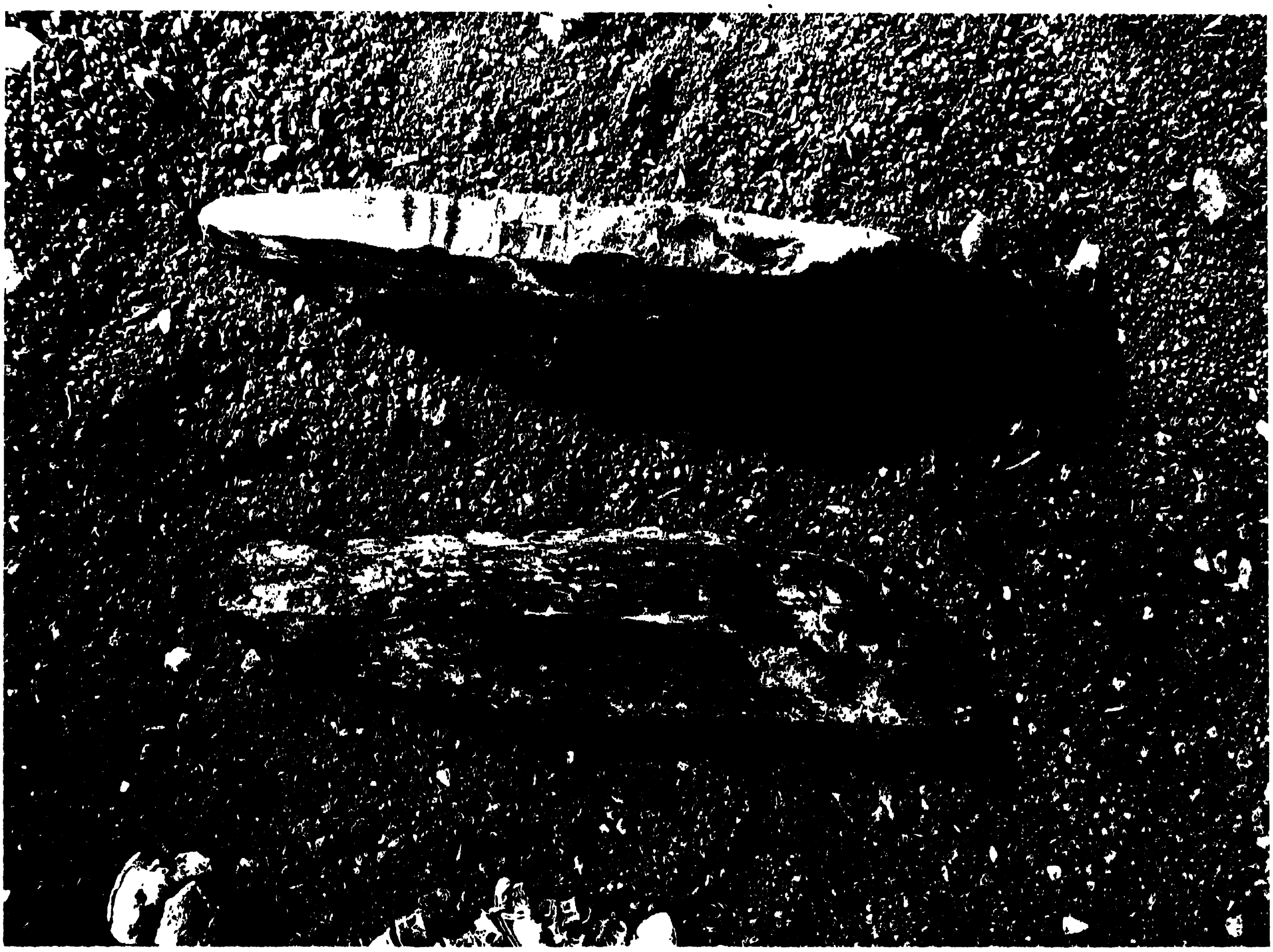


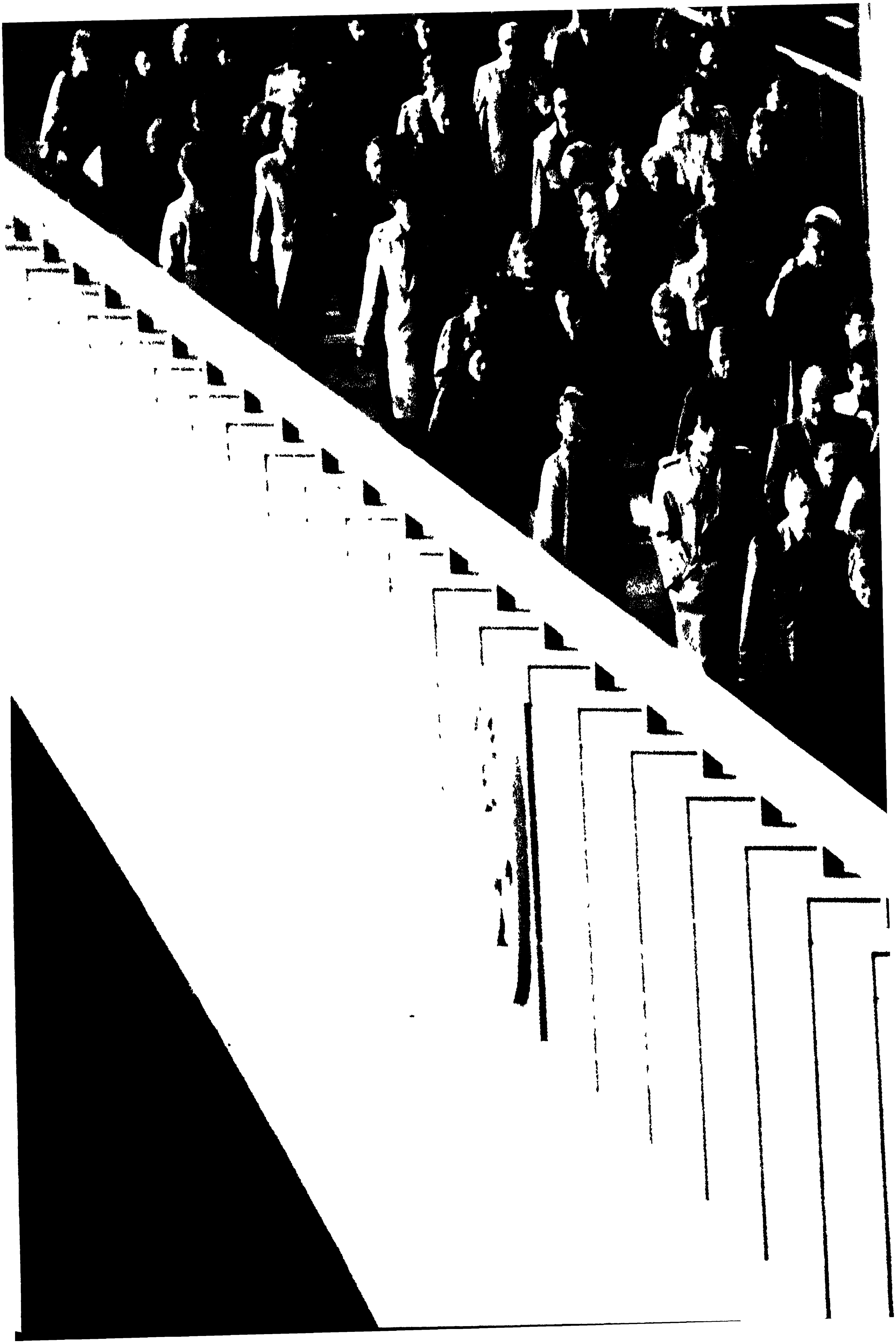


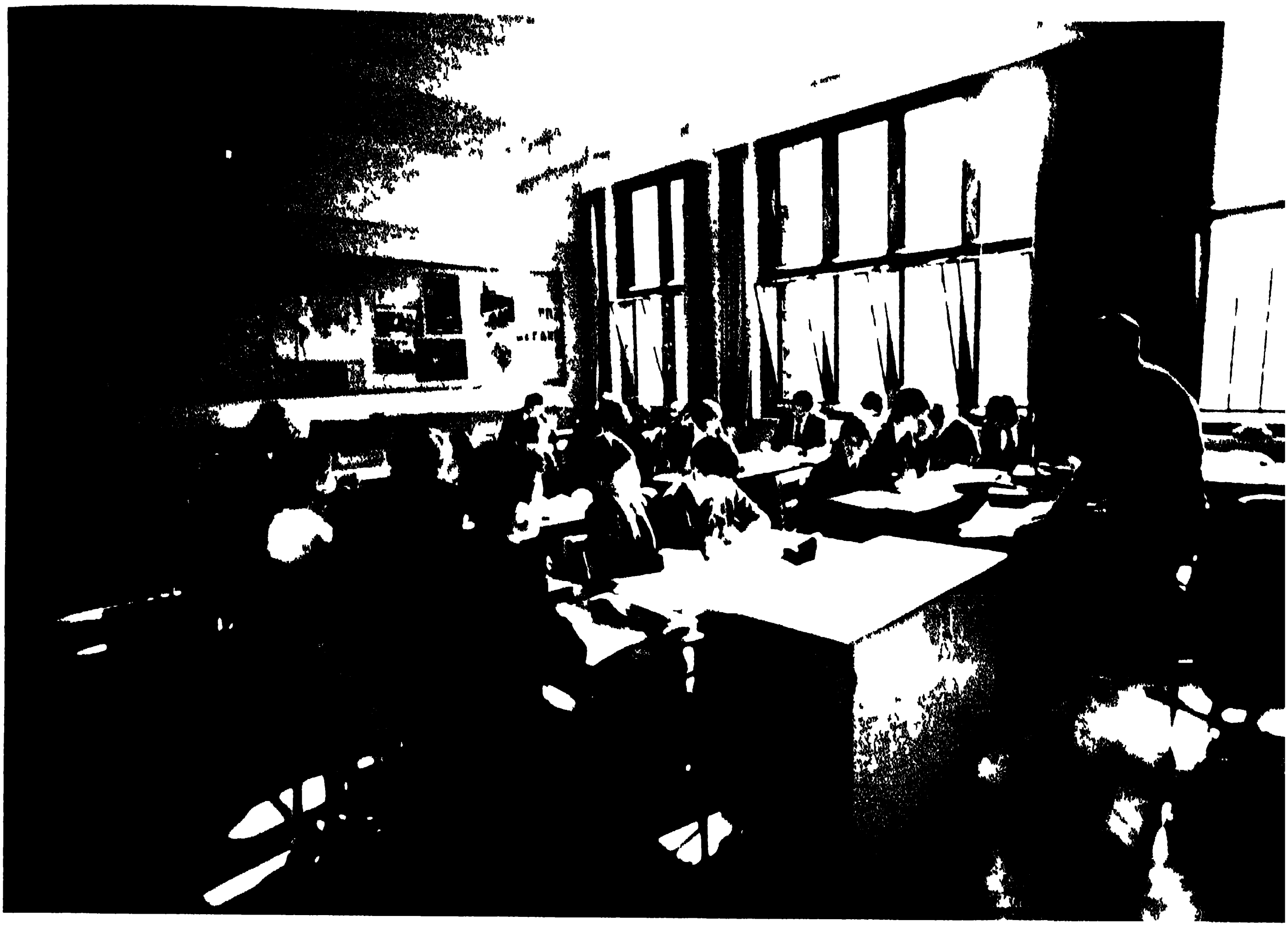


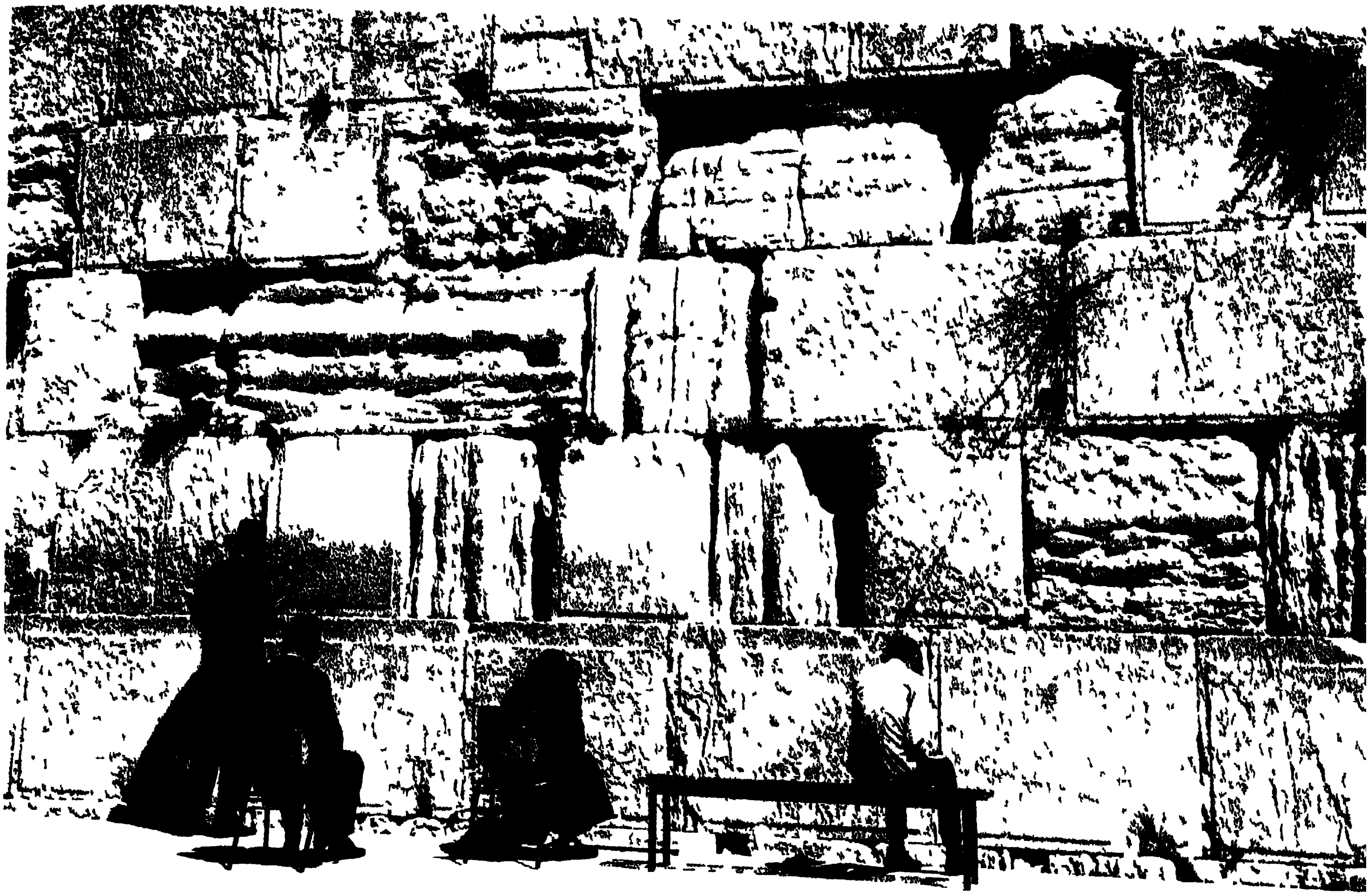


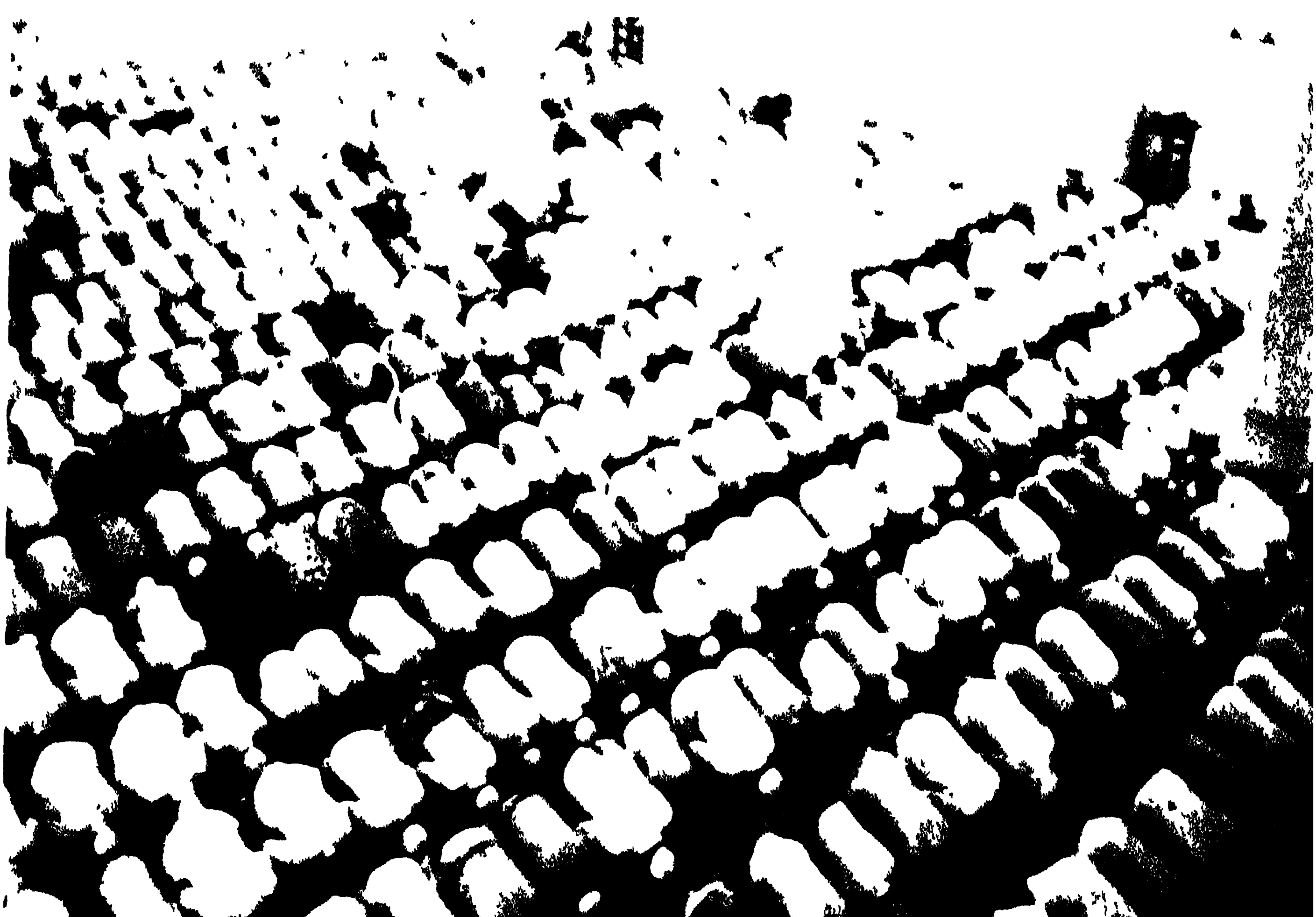
The Human Population

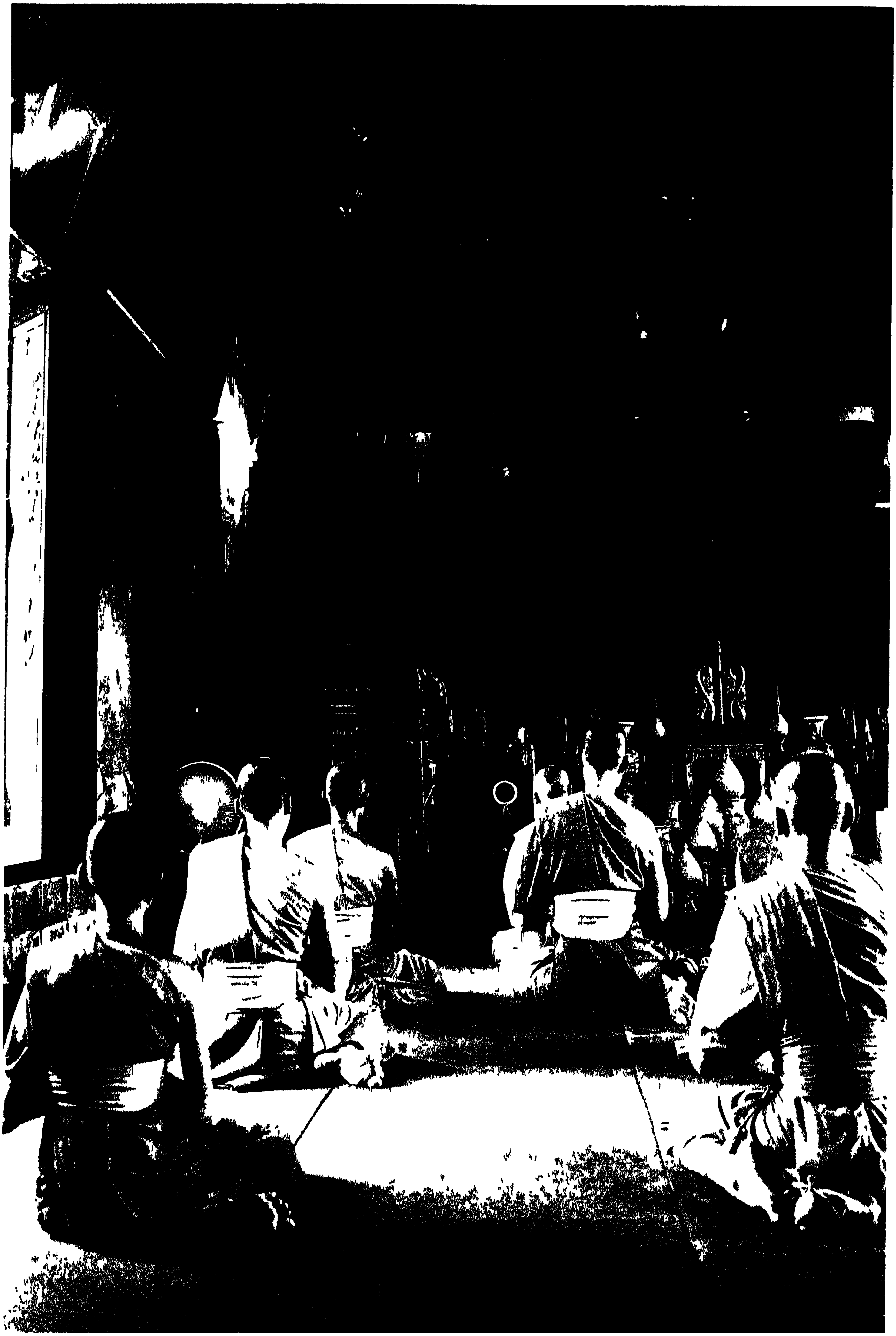




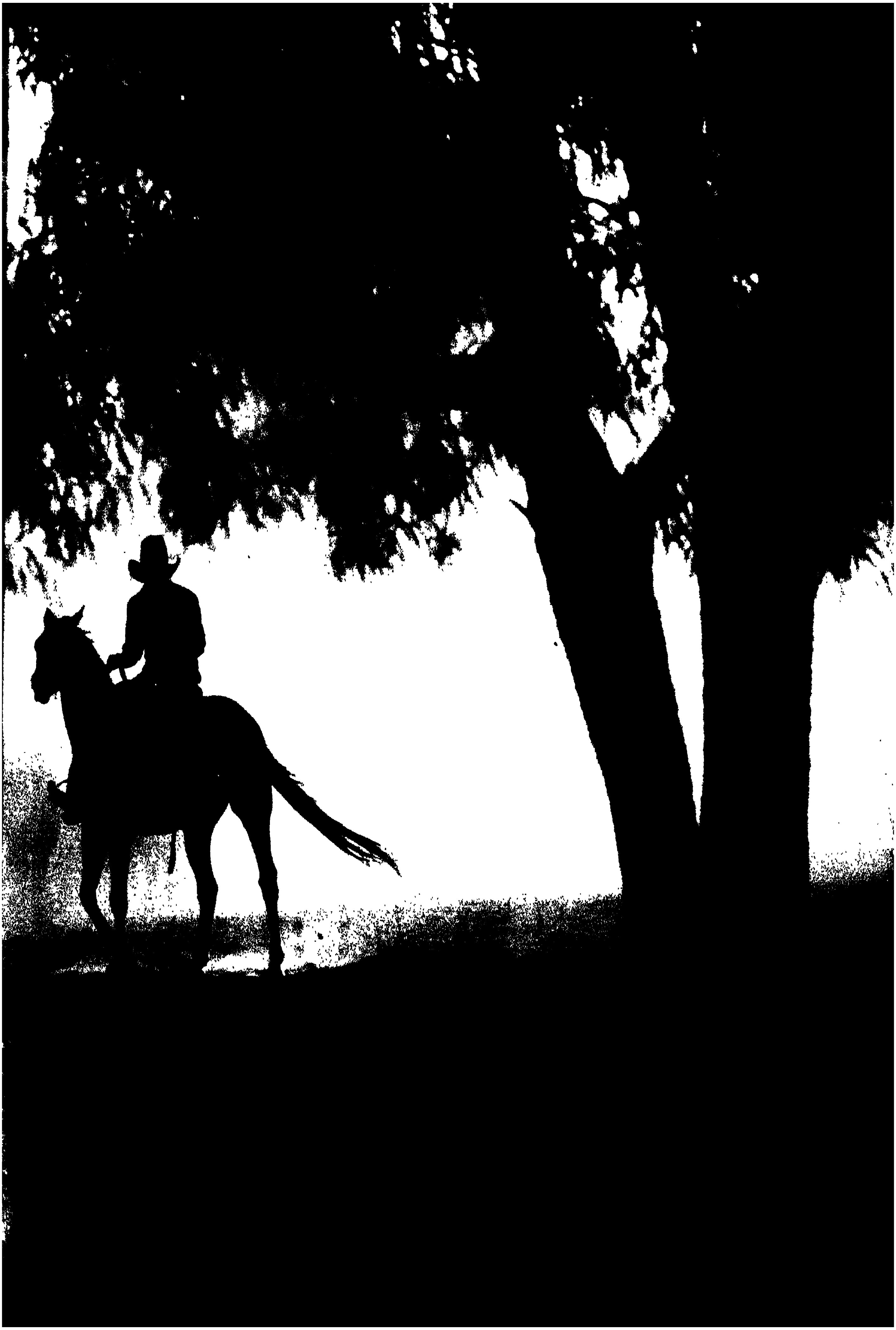


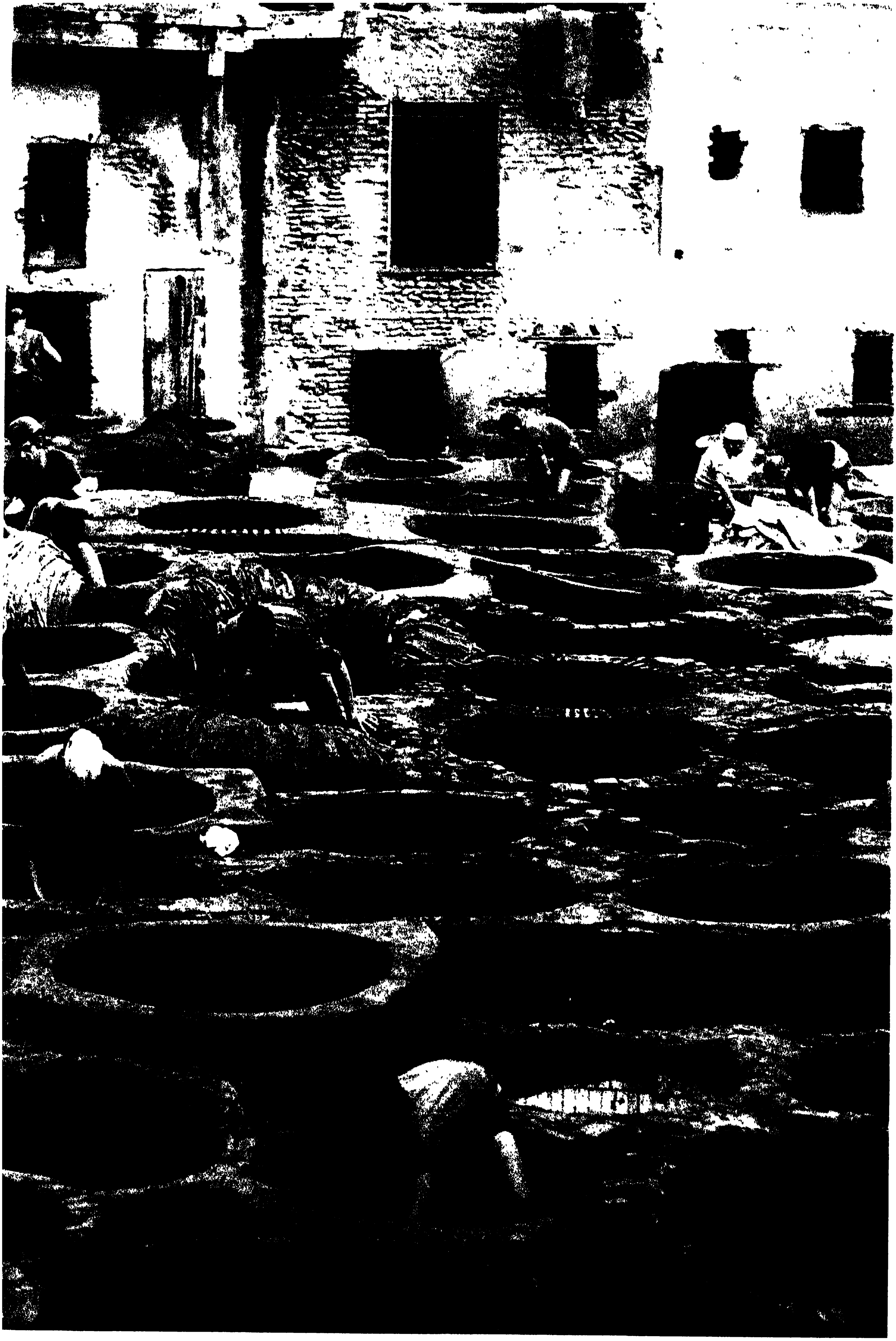


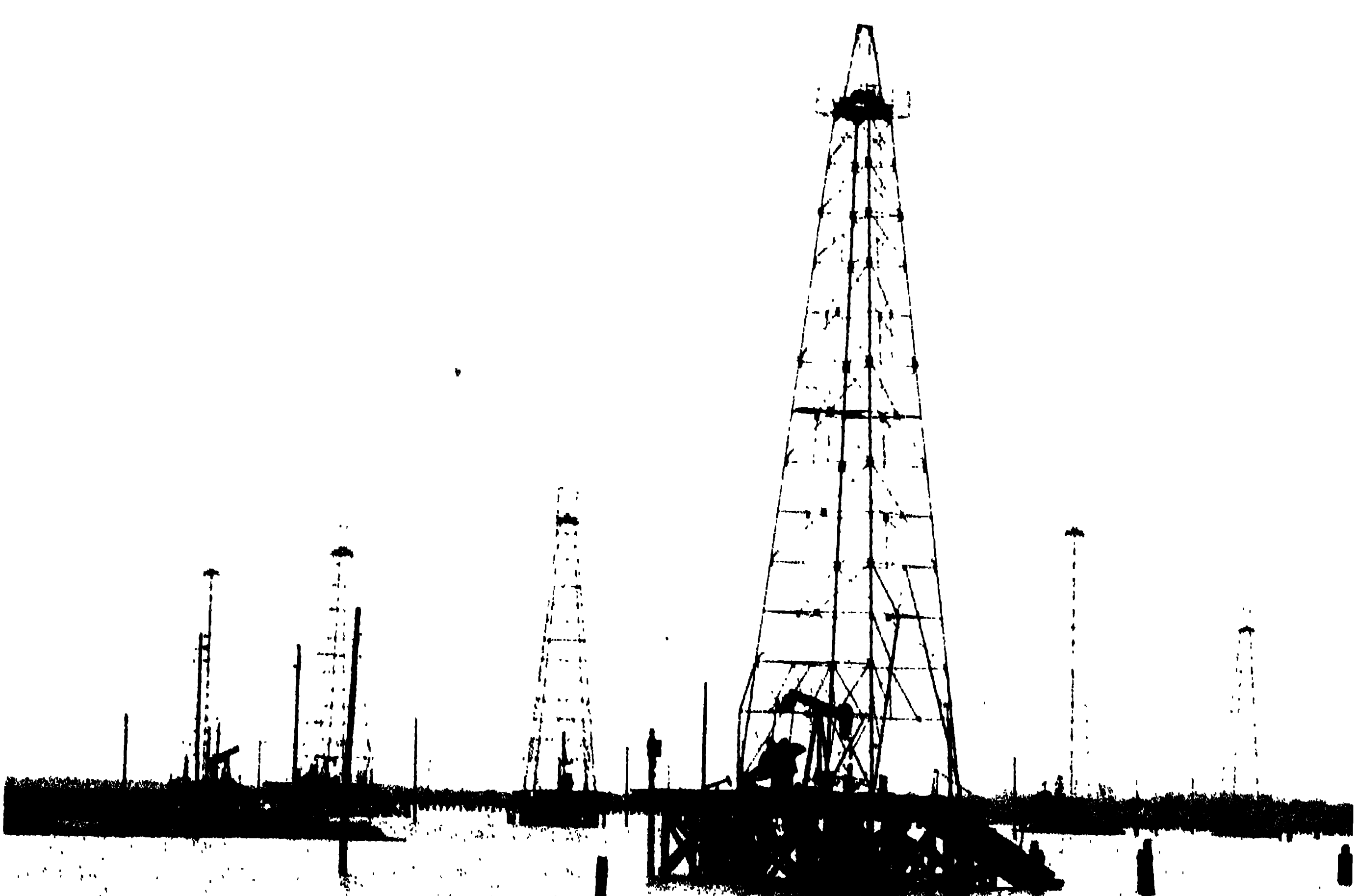


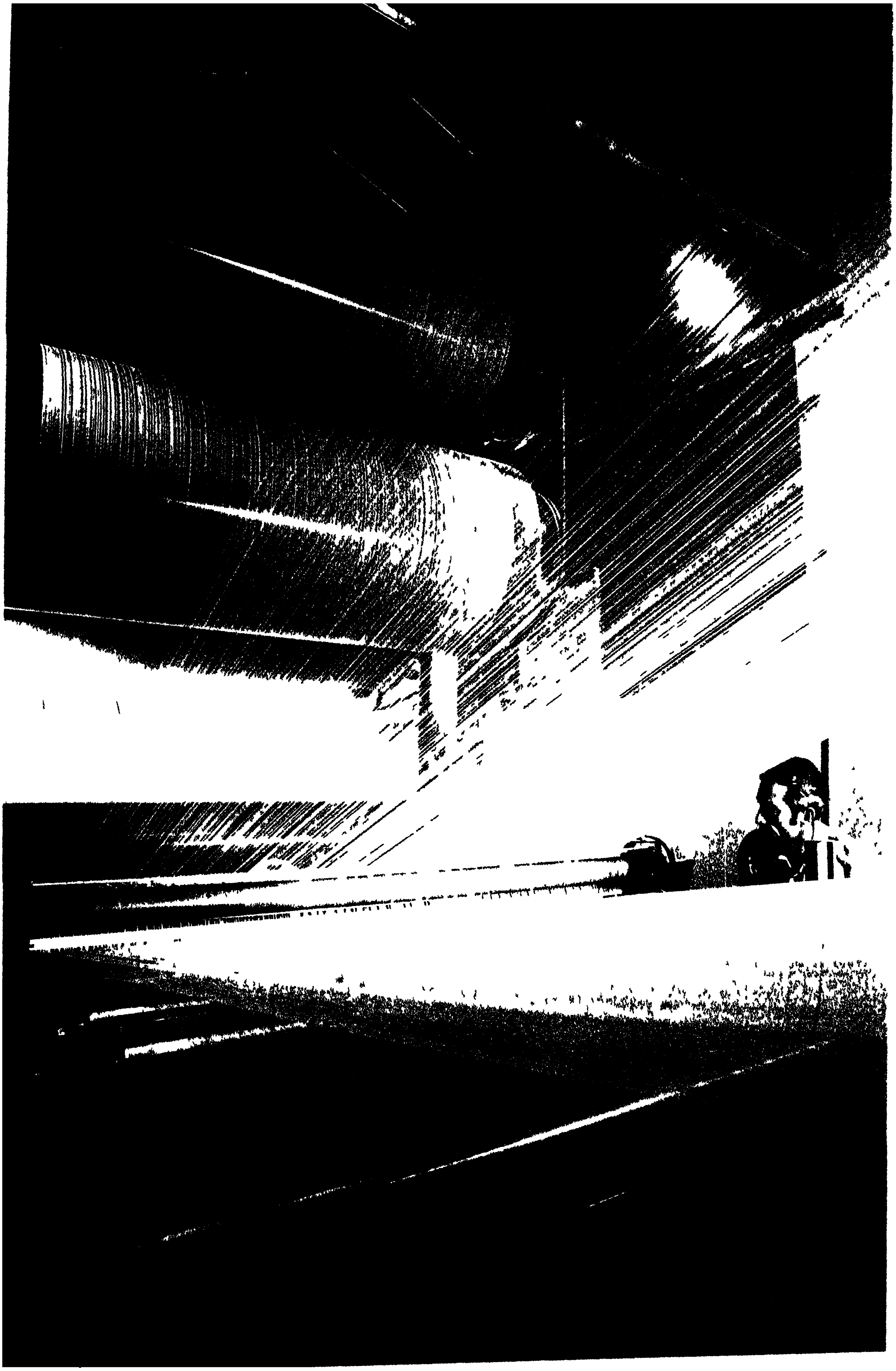


Economic Resources







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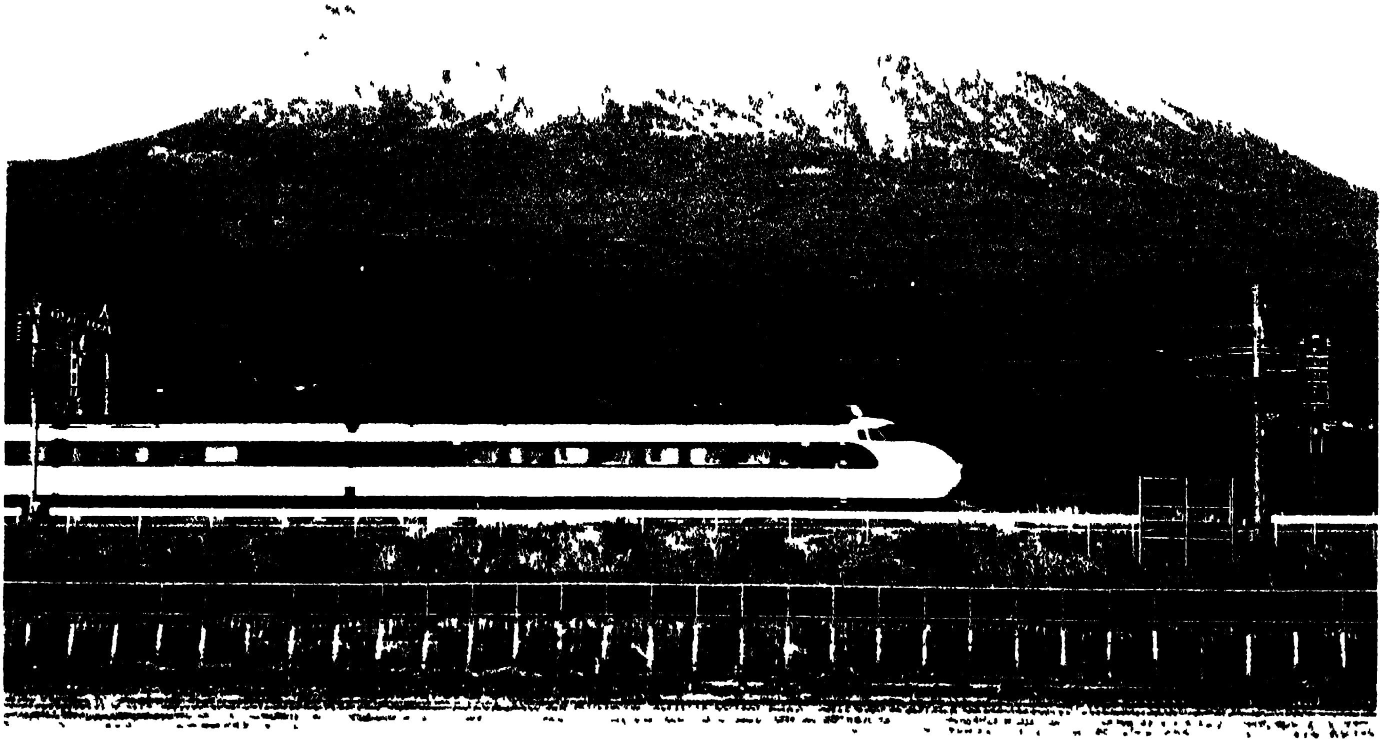


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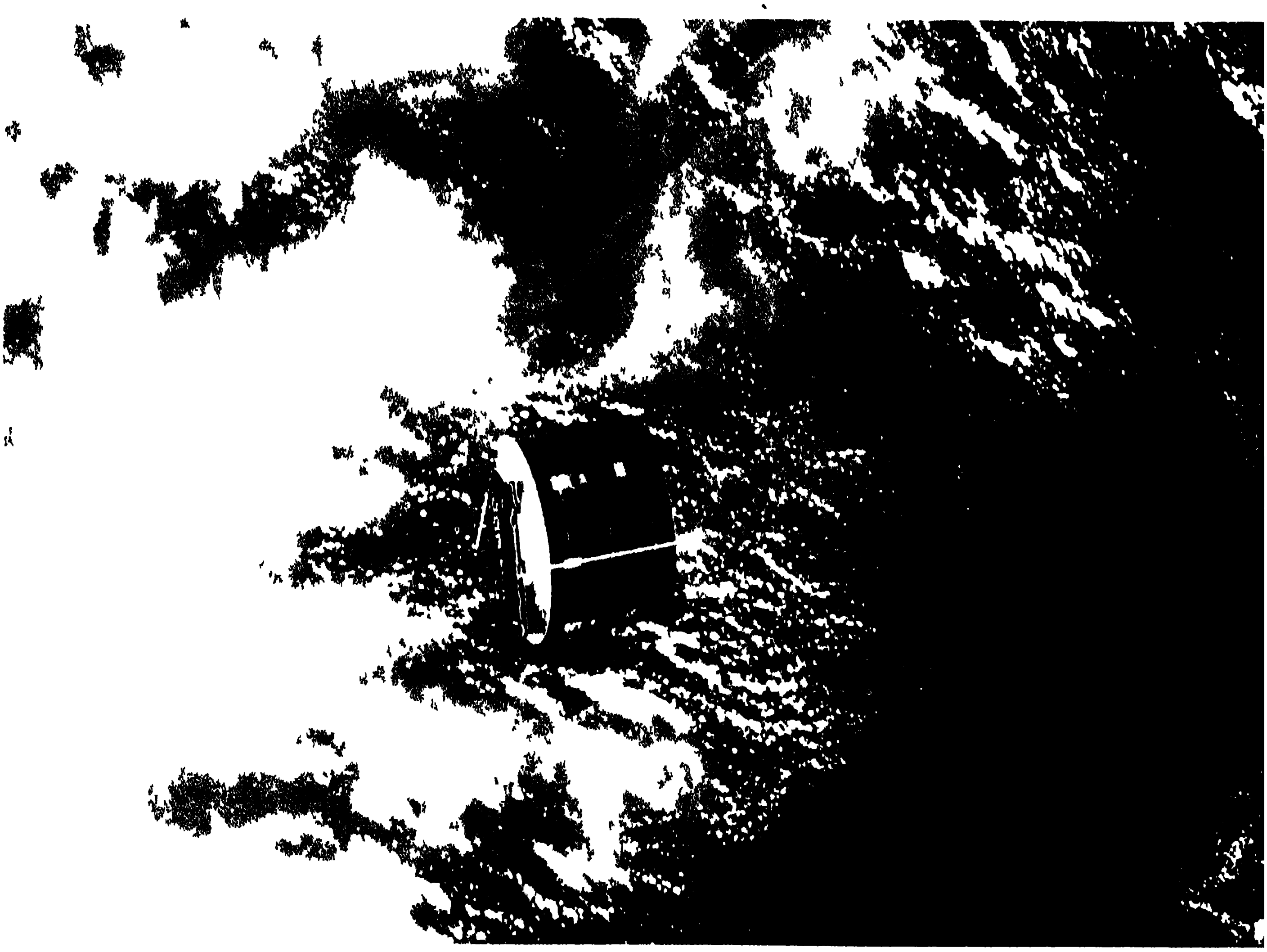

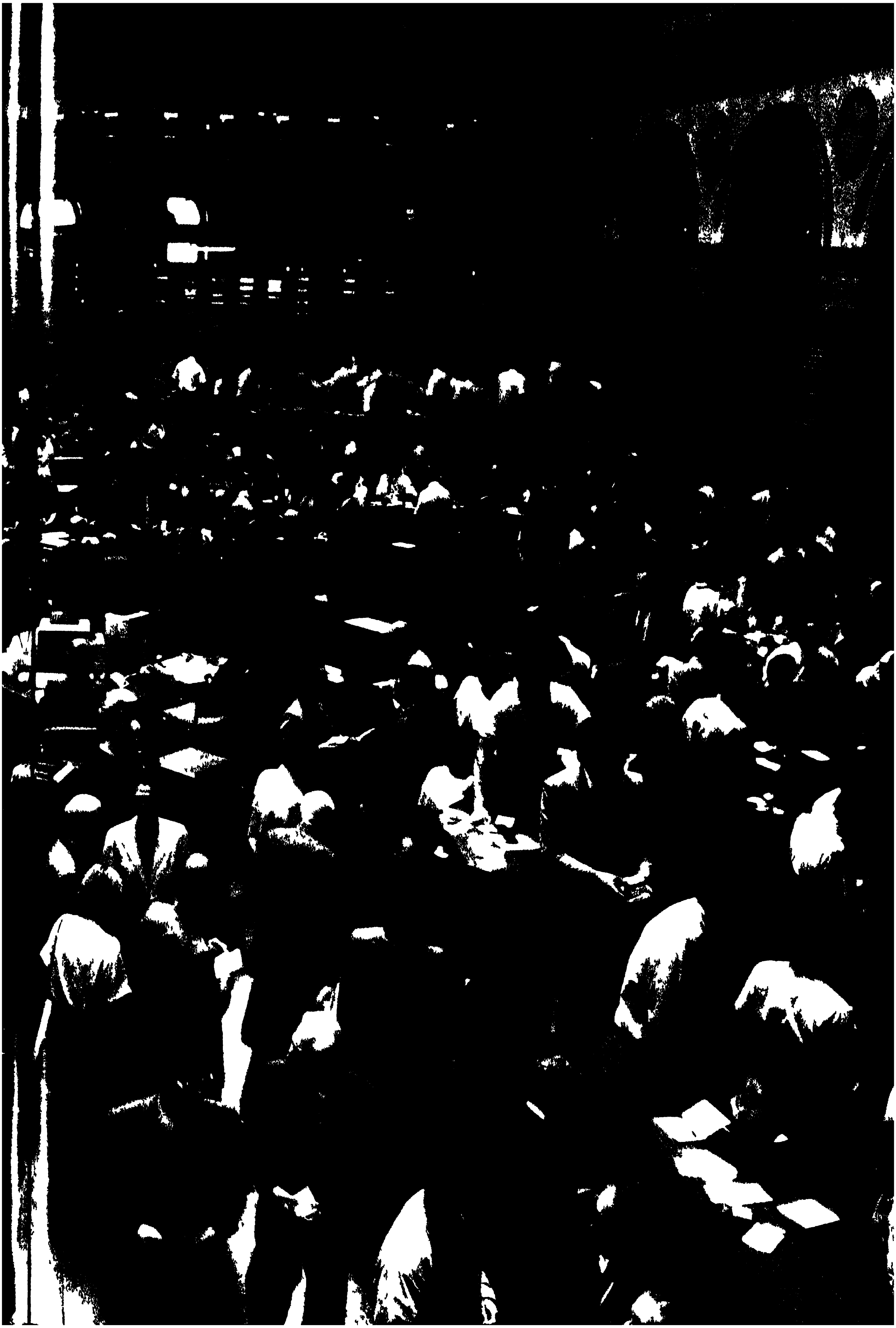


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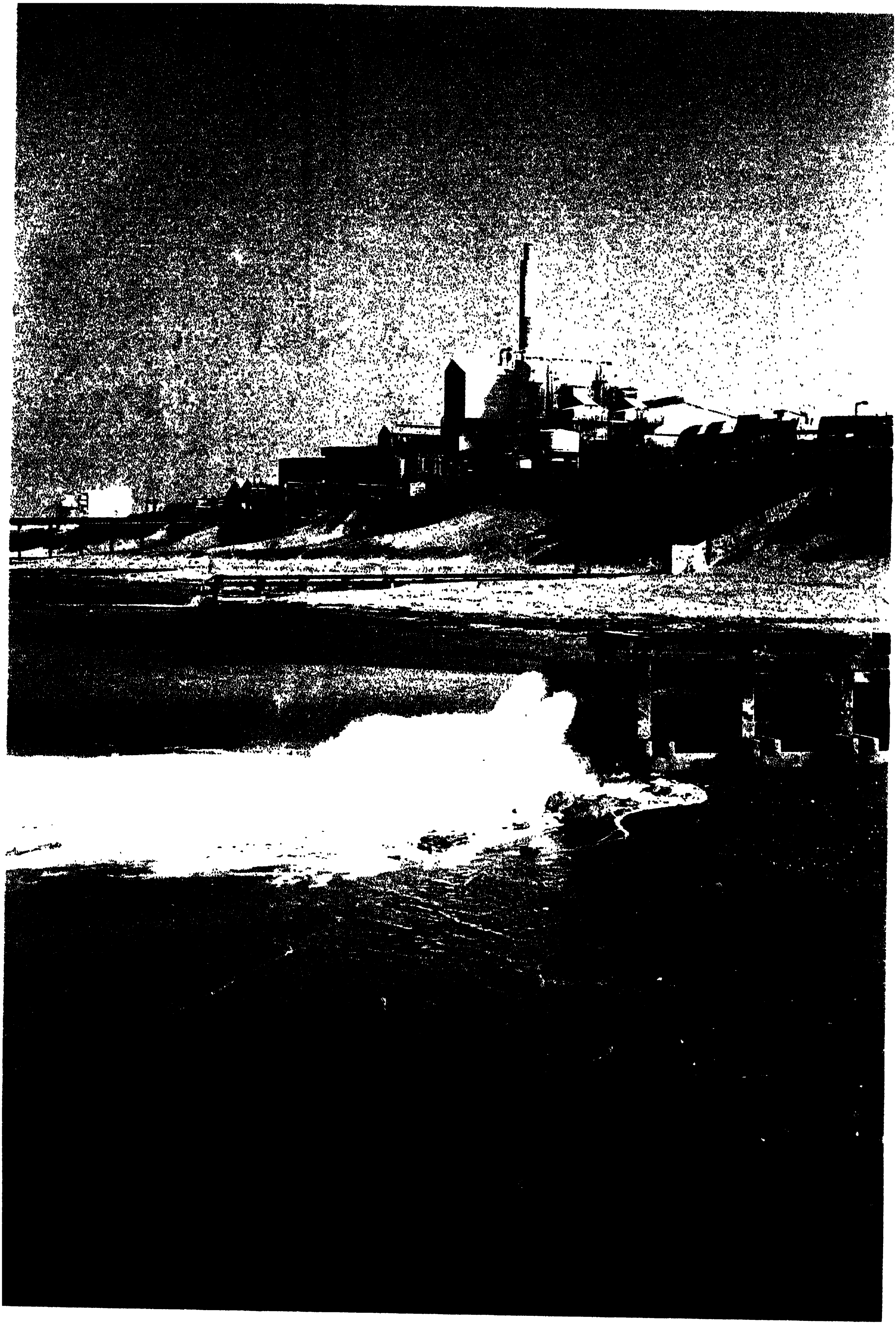


World Statistics

The section of statistics compiled below is intended—through description and analysis of demographic, social, and economic phenomena—to unfold a panorama of information useful in proving a fuller understanding of contemporary reality and, through elaboration of the data collected, to forecast the future course of the parameters noted.

This, like any statistical survey, was carried out in two steps: first, a "descriptive" approach based on the preselection of appropriate statistical indicators yielding data organized according to one or more attributes. The second step, "inductive" or "inferential," is more frankly interpretive and formulates hypotheses on how to read these data and predict the future. Moreover, to avoid as much as possible a lack of methodological homogeneity in the search and compilation of the data, it was preferable to rely on statistics processed by organizations operating on an international scale.

In the section which follows the reader will therefore find ten tables prepared according to rigorous criteria which have been designed to supply the greatest possible amount of information on the current and future state of the world.

Table 1 provides demographic data and vital statistics on all countries, including population structure (distribution and density) and dynamics (rates of demographic growth, birth, mortality, life expectancy, population projections for the year 2000 and, by age groups, the year 2025). Table 2 also deals with demographic factors, covering such social indicators as food and energy consumption, health, illiteracy, student distribution, and public expenditures for education.

All the other tables, with the exception of Table 6, deal with the dynamics of the world economy on a country-by-country basis. Thus, Table 3 is a summary of labor and economic development with data on the work force, gross national product (per capita and economic sector), inflation rate, and fluctuations in consumer prices. Table 4 covers money and finance (national currencies and their rates of exchange as well as money reserves and external debt) and Table 5 illustrates foreign trade and tourism (including the volume of exports and imports, balance of payments, and tourist flow). Table 6 describes the transportation networks (roads, rails, ships, and airports) and communications media (books, dailies, and periodicals).

Tables 7, 8, 9, and 10 survey economic production for a range of products and their national share of world output, with specific reference to agriculture, livestock, and fisheries; minerals and metallurgy; industry and industrial goods; and, finally, energy resources and the production and circulation of transportation means.

Statistical sources. The following list indicates all the sources used in the compilation of the data which appear not only in this section but also in the statistical information provided for each country (geopolitical summary, climate data, administrative structure, and socioeconomic data) and in the tables and graphs included in the "General Geography" section.

Calendario Atlante De Agostini 1993, Novara 1992
The Statesman's Year-Book 1992–93, London 1992
The World Almanac and Book of Facts 1993, New York 1992
Der Fischer Weltalmanach 1993, Bonn 1992
Atlaséco de poche 1993, Paris 1992
Almanaque Mondial 1993, Virginia Gardens 1992
L'état du monde 1992–1993, Paris 1992
Demographic Yearbook 1988, UN, New York 1988
Population and Vital Statistics Report, UN, New York 1991
World Development Report and *World Tables 1992*, World Bank, Washington 1992
Economic Review (various issues), IMF, Washington 1992
FAO Yearbook 1991 (various sections), FAO, Rome 1992
Industrial Statistics Yearbook 1990, UN, New York 1992
Images économiques du monde '92- '93, Paris 1992
International Financial Statistics, IMF, Washington 1990
World Health Statistics Annual 1991, WHO, Geneva 1990
Statistical Yearbook 1990, UNESCO, Paris 1990
World of Learning 1991, London 1991

Table 1 — Population: structure and dynamics

	Area (mi²/'000)	Population (millions)	Density (inh./mi²)	Year	Population by age group, 1990 (0–14 yr)	(15–64 yr)	(over 65)	Demogr. incr. (%, 1980–89)	Birth rate (x 1000, 1989)
EUROPE									
Albania	11	3.3	293	90	33.5	61.2	5.3	2.0	24.7
Andorra	.17	0.05	297	86	–	–	–	3.2	12.6
Austria	32	7.8	241	91	17.5	67.4	15.1	0.1	11.0
Belgium	12	9.9	842	89	17.9	67.0	15.1	0.1	12.0
Bulgaria	43	9	210	90	19.9	66.6	13.5	0.1	12.6
ex Czechoslovakia	49	15.6	316	91	23.2	65.0	11.8	0 2	13.6
Denmark	17	5.2	306	90	16.9	67.8	15.3	–	11.0
Finland	131	5	39	89	19.5	67.2	13.3	0.4	12.0
France	210	56.6	269	90	20.1	66.2	13.7	0.4	14.0
Germany	138	80	578	90	16.2	68.8	15.0	0.1	10.0
ex GDR	–	–	–	–	–	–	–	–0.1	12.0
ex GFR	–	–	–	–	–	–	–	–	–
Great Britain (UK)	94	55.5	588	90	18.9	65 4	15.7	0.2	14.0
Greece	51	10.3	194	91	19.0	66 9	14 1	0.4	11.0
Hungary	36	10.4	290	90	19.5	67.0	13.5	–0.2	12.0
Iceland	40	0.3	6.5	90	–	–	–	1.0	18 7
Ireland	27	3.5	132	86	26.7	61.9	11.4	0 4	16.6
Italy	116	56.4	484	91	16.4	68.7	14 9	0.2	10.0
Lichtenstein	.06	0 03	466	91	–	–	–	0.9	13.2
Luxembourg	1 2	0.4	386	91	–	–	–	0 1	12.4
Malta	.12	0.3	2,922	91	–	–	–	1 0	15.2
Monaco	–	0.03	–	82	–	–	–	0 7	22 9
Netherlands	16	14.9	1,137	90	17 6	69.2	13.2	0.5	12 0
Norway	125	4.2	34	90	19 0	64.6	16 4	0.4	13.0
Poland	121	38.2	316	90	25.1	64 9	10.0	0.7	15 0
Portugal	36	10 3	290	89	20.7	66.3	13 0	0.6	12.0
Romania	92	23 2	254	90	23.8	65 9	10.3	0.4	16.0
San Marino	–	0.02	982	76	–	–	–	1.1	10.0
Spain	195	38 4	197	91	19 8	67.0	13.2	0.4	12.0
Sweden	174	8.6	49	91	17 4	64.6	18.0	0.2	13.0
Switzerland	16	6 9	430	91	17.0	68.1	14.9	0 5	12.0
ex USSR	–	–	–	–	–	–	–	–	–
ex USSR (Asia)	6,497	81.76	13	90	–	–	–	–	–
ex USSR (Europe)	2,034	199.58	98	90	–	–	–	–	–
- Estonia	17	1.6	91	91	22.0	66.0	12.0	0.2	14.0
- Georgia	27	5 4	202	89	–	–	–	0.9	17.0
- Latvia	25	2.7	109	89	21.5	66.4	12.1	0.1	14.0
- Lithuania	25	3.8	148	89	22.6	66 4	11.0	0.4	15.0
CIS									
- Armenia	12	3.3	285	89	–	–	–	0.2	24.0
- Azerbaijan	34	7	210	89	–	–	–	2.0	26.0
- Belarus	80	10.2	127	89	–	–	–	0.3	14.0
- Kazakhstan	1,049	16.5	16	89	–	–	–	1.4	22.0
- Kyrgyzstan	77	4.3	57	89	–	–	–	2.2	29.0
- Moldova	13	4.3	334	89	–	–	–	0.8	18.0
- Russia	6,591	147.4	23	89	–	–	–	–	–
- Tajikistan	55	5.5	98	91	–	–	–	–	–
- Turkmenistan	188	3.5	18	89	–	–	–	–	–
- Ukraine	233	51.7	223	[illegible]	–	–	–	–	–
- Uzbekistan	173	21.3	124	91	–	–	–	–	–
ex Yugoslavia	–	–	–	–	22.7	67.8	9.5	–	15.0

Table 1 — Population: structure and dynamics

	Mortality (x 1000, 1989)	Infant mort. (x 1000, 1989)	Life expect. (years, 1989)	Pop. in 2000 (millions)	Pop. in 2025 by age group (0–14 yr)	(15–64 yr)	(over 65)	Urban pop. (%, 1989)
EUROPE								
Albania	5.7	28.2	69.4	4.0	–	–	–	35.8
Andorra	4.2	13.3	74.0	–	–	–	–	64.7
Austria	11.0	8.0	76.0	8.0	15.3	60.5	24.2	58.0
Belgium	11.0	9.0	76.0	10.0	15.9	59.8	24.3	97.0
Bulgaria	11.8	14.4	68.2	9.1	17.9	61.1	21.0	67.6
ex Czechoslovakia	11.6	11.3	68.9	6.1	19.1	62.9	18.0	75.7
Denmark	12.0	8.0	75.0	5.0	15.3	60.2	24.5	87.0
Finland	10.0	6.0	75.0	5.0	6.3	58.8	24.9	60.0
France	10.0	7.0	77.0	59.0	17.3	60.6	22.1	74.0
Germany	11.0	8.0	75.0	–	–	–	–	86.0
ex GDR	12.4	–	–	–	–	–	–	82.8
ex GFR	–	–	–	–	14.3	58.8	26.9	–
Great Britain (U.K.)	11.0	9.0	76.0	59.0	17.5	61.2	21.3	89.0
Greece	9.0	11.0	77.0	10.0	15.4	60.6	24.0	62.0
Hungary	13.0	17.0	71.0	10.0	17.7	61.6	20.7	61.0
Iceland	6.7	4.0	75.7	0.3	–	–	–	90.7
Ireland	9.0	8.0	74.0	4.0	19.7	64.9	15.4	57.0
Italy	10.0	9.0	76.0	58.0	14.3	61.0	24.7	69.0
Lichtenstein	6.8	2.7	66.0	–	–	–	..	–
Luxembourg	10.6	9.9	71.2	0.4	–	–	–	84.3
Malta	7.7	11.3	73.8	0.4	–	–	–	85.3
Monaco	18.5	9.0	72.0	–	–	–	–	100.0
Netherlands	9.0	7.0	77.0	16.0	15.4	59.7	24.9	89.0
Norway	10.0	8.0	75.0	4.2	17.1	61.0	21.9	75.0
Poland	10.0	16.0	71.0	40.0	19.7	62.3	18.0	61.0
Portugal	9.0	13.0	75.0	11.0	16.5	63.4	20.1	33.0
Romania	10.0	27.0	71.0	25.0	20.0	63.6	16.4	52.0
San Marino	6.0	23.3	69.0	0.13	–	–	–	25.7
Spain	8.0	8.0	77.0	41.0	16.2	63.0	20.8	78.0
Sweden	12.0	6.0	77.0	9.0	17.6	59.3	23.1	84.0
Switzerland	10.0	7.0	78.0	7.0	15.8	58.3	25.9	60.0
ex USSR	–	–	–	–	–	–	–	65.9
ex USSR (Asia)	–	–	–	–	–	–	–	–
ex USSR (Europe)	–	–	–	–	–	–	–	65.8
- Estonia	12.0	25.0	66.0	–	–	–	–	71.0
- Georgia	9.0	33.0	68.0	–	–	–	–	56.0
- Latvia	13.0	19.0	65.0	–	–	–	–	71.0
- Lithuania	11.0	18.0	67.0	–	–	–	–	69.0
CIS								
- Armenia	6.6	–	72.0	–	–	–	–	68.2
- Azerbaijan	7.0	45.0	67.0	–	–	–	–	53.0
- Belarus	11.0	20.0	62.0	–	–	–	–	67.0
- Kazakhstan	8.0	44.0	64.0	–	–	–	–	58.0
- Kyrgyzstan	7.0	35.0	64.0	–	–	–	–	38.0
- Moldova	10.0	35.0	66.0	–	–	–	–	48.0
- Russia	11.0	30.0	64.0	–	–	–	–	74.0
- Tajikistan	6.0	73.0	67.0	–	–	–	–	31.0
- Turkmenistan	7.0	93.0	62.0	–	–	–	–	45.0
- Ukraine	12.0	22.0	66.0	–	–	–	–	68.0
- Uzbekistan	6.0	64.0	69.0	–	–	–	–	40.0
ex Yugoslavia	9.0			15.0	18.6	62.1	19.3	–

(continues)

Table 1 — Population: structure and dynamics

	Area (mi²/'000)	Population (millions)	Density (inh./mi²)	Year	Population by age group, 1990 (0–14 yr)	(15–64 yr)	(over 65)	Demogr. incr. (%, 1980–89)	Birth rate (x 1000, 1989)
- Bosnia-Herzegovina	20	4.4	220	91	–	–	–	0.8	14.0
- Croatia	22	4.7	218	91	–	–	–	0.1	12.0
- Macedonia	10	2	205	91	–	–	–	1.0	–
- Slovenia	8	2	251	91	–	–	–	0.3	13.0
- Yugoslavia (Fed. Rep.)	39	10.3	262	91	–	–	–	–	–
ASIA									
Afghanistan	252	13.7	54	82	–	–	–	3.9	48
Bahrain	.27	0.5	1,886	90	–	–	–	3.5	31.3
Bangladesh	56	108	1,943	91	42.9	54.0	3.1	2.6	37.0
Bhutan	18	1.5	80	90	39.9	56.8	3.3	2.1	39.0
Brunei	2	0.2	111	89	–	–	–	2.9	27.6
Cambodia	70	8.2	119	90	34.8	62.3	2.9	2.5	41.8
China	3,681	1,160	313	91	27.0	67.2	5.8	1.4	22.0
Cyprus	3	0.7	197	90	–	–	–	1.1	18.6
Hong Kong	–	5.4	1,438	86	21.0	70.2	8.8	1.4	11.8
India	1,269	844.3	666	91	36.9	58.7	4.4	2.1	31.0
Indonesia	752	179.3	238	90	35.8	60.3	3.9	2.1	27.0
Iran	63	53.9	85	88	44.4	52.6	3.0	3.5	38.6
Iraq	168	18.3	109	89	46.5	50.8	2.7	3.6	42.0
Israel	8	4.5	560	88	31.2	59.9	8.9	1.7	22.0
Japan	144	123.6	858	90	18.4	69.7	11.9	0.6	11.1
Jordan	38	3.7	97	86	45.4	52.1	2.5	3.3	43.0
Korea, North	47	22.9	492	90	–	–	–	2.4	24.1
Korea, South	38	42.8	1,119	90	25.1	69.4	5.5	1.2	16.0
Kuwait	7	2	311	90	35.6	63.0	1.4	4.4	27.0
Laos	92	3.9	44	89	44.8	53.3	1.9	2.7	47.0
Lebanon	4	2.9	723	89	–	–	–	2.1	28.0
Malaysia	127	17.8	140	90	38.3	58.1	3.6	2.6	30.0
Maldives	.12	0.21	1,860	90	–	–	–	3.4	41.2
Mongolia	604	2	3	89	40.7	55.7	3.6	3.3	37.5
Myanmar (Burma)	262	41.6	158	90	37.1	58.8	4.1	2.1	30.0
Nepal	57	19	332	90	42.0	54.9	3.1	2.6	41.0
Oman	116	2	18	90	46.3	51.3	2.4	4.7	44.0
Pakistan	307	105.4	342	89	44.2	53.0	2.8	3.2	46.0
Philippines	116	60.5	521	90	39.9	56.8	3.3	2.5	33.0
Qatar	4	0.4	96	89	–	–	–	4.0	31.8
Saudi Arabia	831	15	18	90	45.5	51.9	2.6	5.0	44.0
Singapore	.2	3	12,435	90	23.6	70.9	5.5	1.2	18.0
Sri Lanka	25	16.4	645	87	32.3	62.7	5.0	1.5	21.0
Syria	71	11.3	158	88	48.2	49.1	2.7	3.6	45.0
Taiwan	14	20.2	1,453	90	–	–	–	1.1	16.6
Thailand	198	54.5	275	90	33.9	63.1	3.0	1.9	22.0
Turkey	301	51	174	90	34.8	60.9	4.3	2.4	29.0
United Arab Emirates	32	1.9	60	90	30.8	67.5	1.7	4.6	23.0
Vietnam	127	63.4	497	89	39.6	55.9	4.5	2.2	31.4
Yemen	204	12	57	90	48.7	48.2	3.1	3.4	53.0
AFRICA									
Algeria	920	25.3	28	90	48.6	52.7	3.7	3.0	36.0
Angola	481	9.4	18	88	44.8	52.1	3.1	2.6	47.0
Benin	44	4.4	101	87	47.6	49.7	2.7	3.2	46.0

Table 1 — Population: structure and dynamics

	Mortality (x 1000, 1989)	Infant mort. (x 1000, 1989)	Life expect. (years, 1989)	Pop. in 2000 (millions)	Pop. in 2025 by age group (0–14 yr)	(15–64 yr)	(over 65)	Urban pop. (%, 1989)
- Bosnia-Herzegovina	6.0	15.2	70.5	–	–	–	–	36.2
- Croatia	11.0	10.0	71.0	–	–	–	–	50.8
- Macedonia	–	35.3	70.0	–	–	–	–	53.9
- Slovenia	10.0	8.9	71.0	–	–	–	–	48.9
- Yugoslavia (Fed. Rep.)	–	24.0	70.5	–	–	–	–	47.0
ASIA								
Afghanistan	22.0	154.0	47.0	24.5	–	–	–	17.7
Bahrain	3.8	23.5	65.0	0.7	–	–	–	82.7
Bangladesh	14.0	106.0	51.0	145.0	26.3	69.1	4.6	16.0
Bhutan	17.0	125.0	48.0	2.0	32.8	62.9	4.3	5.0
Brunei	3.3	9.0	72.6	0.4	–	–	–	63.6
Cambodia	16.9	131.0	46.5	10.4	–	–	–	12.0
China	7.0	30.0	70.0	1,275.0	20.7	66.4	12.9	53.0
Cyprus	8.8	11.0	73.9	0.8	–	–	–	63.6
Hong Kong	5.0	5.9	74.6	–	–	–	–	100.0
India	11.0	95.0	59.0	1,007.0	24.1	68.4	7.5	27.0
Indonesia	9.0	64.0	61.0	213.0	23.3	68.2	8.5	30.0
Iran	3.9	90.0	63.0	70.0	38.8	56.9	4.3	54.0
Iraq	8.0	67.0	63.0	26.0	32.0	63.6	4.4	71.0
Israel	7.0	10.0	76.0	5.0	21.2	65.1	13.7	91.0
Japan	6.2	4.0	79.0	129.0	15.7	58.8	25.5	77.0
Jordan	6.0	53.0	67.0	6.0	32.7	63.1	4.2	67.0
Korea, North	5.6	33.3	65.6	28.2	–	–	–	59.6
Korea, South	6.0	23.0	70.0	47.0	18.0	66.0	16.0	71.0
Kuwait	3.0	15.0	74.0	3.0	21.3	64.9	13.8	95.0
Laos	17.0	105.0	49.0	6.0	37.0	59.5	3.5	18.0
Lebanon	7.0	49.2	64.7	3.6	–	–	–	80.8
Malaysia	5.0	22.0	70.0	22.0	23.6	67.4	9.0	42.0
Maldives	7.6	48.0	58.0	0.28	–	–	–	25.9
Mongolia	8.7	64.4	61.9	2.6	25.9	67.9	6.2	58.0
Myanmar (Burma)	9.0	66.0	61.0	50.0	24.0	68.5	7.5	25.0
Nepal	15.0	124.0	52.0	24.0	29.0	65.9	5.1	9.0
Oman	6.0	36.0	65.0	2.0	36.8	58.5	4.7	10.0
Pakistan	12.0	106.0	55.0	154.0	33.9	62.4	3.7	32.0
Philippines	8.0	35.0	63.0	75.0	23.9	68.4	7.7	39.0
Qatar	2.5	31.0	65.2	0.6	–	–	–	88.3
Saudi Arabia	18.0	67.0	64.0	20.7	36.3	59.1	4.6	76.0
Singapore	5.0	8.0	74.0	3.0	18.0	61.5	20.5	100.0
Sri Lanka	6.0	20.0	71.0	19.0	21.0	66.0	13.0	21.0
Syria	7.0	44.0	66.0	18.0	34.9	61.3	3.8	50.0
Taiwan	5.2	5.7	71.0	22.5	–	–	–	74.2
Thailand	7.0	28.0	66.0	64.0	21.6	68.2	10.2	22.0
Turkey	8.0	61.0	66.0	68.0	23.1	67.6	9.3	60.0
United Arab Emirates	4.0	24.0	71.0	2.0	22.2	60.7	17.1	78.0
Vietnam	9.1	61.0	59.9	83.0	24.2	68.8	7.0	20.1
Yemen	18.0	125.0	48.0	16.0	44.1	54.1	1.8	28.0
AFRICA								
Algeria	8.0	69.0	65.0	33.0	25.7	68.5	5.8	51.0
Angola	19.0	132.0	46.0	14.0	40.1	56.8	3.1	28.0
Benin	13.0	112.0	51.0	6.0	33.4	63.2	3.4	37.0

(continued)

Table 1 — Population: structure and dynamics

	Area (mi²/'000)	Population (millions)	Density (inh./mi²)	Year	Population by age group, 1990 (0–14 yr)	(15–64 yr)	(over 65)	Demogr. incr. (%, 1980–89)	Birth rate (x 1000, 1989)
Botswana	224	1.2	5	89	47.4	49.2	3.4	3.7	48.5
Burkina Faso	106	8.8	83	90	45.5	51.4	3.1	2.6	47.0
Burundi	11	5.3	536	90	45.6	51.4	3.0	2.9	48.0
Cameroon	183	11.5	62	90	46.3	49.9	3.8	3.2	44.0
Cape Verde	2	0.4	236	90	–	–	–	3.2	32.1
Central African Rep.	240	2.8	13	89	42.1	54.9	3.0	2.7	42.0
Chad	496	5.4	10	88	41.9	54.5	3.6	2.4	44.0
Comoros	.73	0.46	648	90	–	–	–	3.1	47.0
Congo	132	2.3	18	90	45.2	50.9	3.9	3.4	48.0
Djibouti	9	0.5	62	88	–	–	–	3.5	19.9
Egypt	364	53	150	90	39.2	56.6	4.2	2.5	10.0
Equatorial Guinea	11	0.4	39	90	–	–	–	2.3	43.8
Eritrea	.46	3	65	88	–	–	–	–	–
Ethiopia	436	44	101	88	47.0	50.2	2.8	3.0	52.0
Gabon	103	1.3	13	78	39.1	56.0	4.9	3.7	42.0
Gambia	4	0.9	212	90	–	–	–	2.8	47.4
Ghana	92	14.9	161	90	46.8	50.3	2.9	3.4	45.0
Guinea	95	6.8	73	90	46.1	51.3	2.6	2.5	48.0
Guinea-Bissau	14	1	70	90	–	–	–	2.7	42.9
Ivory Coast	124	12.1	96	90	47.4	50.1	2.5	4 1	50.0
Kenya	225	23.9	106	89	49.9	47.3	2.8	3.9	46.0
Lesotho	12	1.8	153	89	43.4	53.1	3.5	2.7	41.0
Liberia	43	2.4	57	88	44.9	52 0	3.1	3.2	44.0
Libya	687	4.5	8	90	46.0	51.6	2 4	4.2	44.0
Madagascar	227	11.4	49	90	45.5	51.5	3.0	2.9	46.0
Malawi	46	8.5	236	91	46.7	50.7	2.6	3.4	54.0
Mali	479	8.1	18	90	46.6	50.2	3.2	2.5	50.0
Mauritania	398	1.8	5	87	4 6	52.1	43.3-	2.4	48.0
Mauritius	.77	1 1	1,373	89	29.4	65.2	5.4	1.0	18.0
Morocco	274	25	91	90	40.8	55.6	3.6	2.6	36.0
Mozambique	308	14.4	47	87	4.1	52.7	43.2	2.7	46.0
Namibia	318	1.2	3	87	45.8	51.1	3.1	3.2	44.0
Niger	458	7.5	16	90	47.2	50.2	2.6	3 4	51.0
Nigeria	357	88 5	249	91	46.4	51.0	2.6	3.4	47.0
Rwanda	10	7.1	699	91	48.0	49.5	2.5	3.2	52.0
São Tomé & Principe	.4	0.12	306	89	–	–	–	1.7	30.0
Senegal	76	6.8	91	88	46.7	50.6	2.7	3.0	45.0
Seychelles	.2	0.07	391	87	–	–	–	0.7	24.0
Sierra Leone	28	4.1	150	90	43.4	53.5	3.1	2.5	48.2
Somalia	246	5.1	21	80	46.0	51.0	3.0	3.0	48.0
South Africa	433	30.7	70	90	38.2	57.8	4.0	2.4	34.0
Sudan	967	24.4	26	88	45.2	52.2	2.6	2.8	44.0
Swaziland	7	0.7	114	90	–	–	–	4.5	46.8
Tanzania	362	25.6	65	88	46.7	50.3	3.0	3.1	47.0
Togo	22	3	135	84	48.1	48.8	3.1	3.5	49.0
Tunisia	63	8	124	90	37.8	58.1	4.1	2.5	30.0
Uganda	93	16.5	179	91	48.7	48.5	2.8	3.2	51.0
Zaire	905	34.1	39	90	46.4	51.0	2.6	3.1	45.0
Zambia	291	7.8	26	90	49.3	48.5	2.2	3.7	49.0
Zimbabwe	151	9.4	62	90	45.5	52.0	2.5	3.5	37.0

Table 1 — Population: structure and dynamics

	Mortality (x 1000, 1989)	Infant mort. (x 1000, 1989)	Life expect. (years, 1989)	Pop. in 2000 (millions)	Pop. in 2025 by age group (0–14 yr)	(15–64 yr)	(over 65)	Urban pop. (%, 1989)
Botswana	11.6	67.0	63.0	2.0	25.3	68.9	5.8	23.8
Burkina Faso	18.0	135.0	48.0	12.0	38.5	58.7	2.8	9.0
Burundi	15.0	70.0	49.0	7.0	41.4	56.2	2.4	5.0
Cameroon	12.0	90.0	57.0	16.0	37.0	59.5	3.5	40.0
Cape Verde	7.7	51.0	63.0	0.4	–	–	–	33.1
Central African Rep.	15.0	100.0	51.0	4.0	33.7	62.6	3.7	46.0
Chad	19.0	127.0	47.0	7.0	37.2	58.9	3.9	29.0
Comoros	13.0	91.0	54.0	0.7	–	–	–	27.6
Congo	15.0	115.0	54.0	3.0	39.2	57.8	3.0	40.0
Djibouti	17.7	122.0	45.4	0.7	–	–	–	80.0
Egypt	9.1	68.0	60.0	66.0	24.4	67.6	8.0	32.0
Equatorial Guinea	19.2	127.0	44.4	0.4	–	–	–	30.2
Eritrea	–	–	–	–	–	–	–	–
Ethiopia	18.0	133.0	48.0	70.0	43.2	54.3	2.5	13.0
Gabon	15.0	98.0	53.0	1.0	38.2	57.5	4.3	45.0
Gambia	21.4	143.0	49.9	1.1	–	–	–	21.5
Ghana	13.0	86.0	55.0	20.0	32.8	63.5	3.7	33.0
Guinea	21.0	140.0	43.0	7.0	40.4	56.8	2.8	25.0
Guinea-Bissau	23.0	151.0	43.1	1.2	–	–	–	29.3
Ivory Coast	14.0	92.0	53.0	18.0	39.5	57.6	2.9	40.0
Kenya	10.0	68.0	59.0	34.0	31.9	64.6	3.5	23.0
Lesotho	12.0	96.0	56.0	2.0	29.2	66.0	4.8	20.0
Liberia	14.0	137.0	54.0	3.0	32.6	63.2	4.2	45.0
Libya	9.0	69.0	62.0	6.0	39.5	56.7	3.8	69.0
Madagascar	16.0	117.0	51.0	15.0	35.1	61.7	3.2	24.0
Malawi	19.0	147.0	48.0	12.0	43.0	54.4	2.6	12.0
Mali	19.0	167.0	48.0	11.0	41.3	56.1	2.6	19.0
Mauritania	19.0	123.0	46.0	3.0	42.4	55.0	2.6	45.0
Mauritius	6.0	21.0	70.0	1.1	18.9	66.8	14.3	41.0
Morocco	9.0	69.0	61.0	32.0	25.9	67.9	6.2	47.0
Mozambique	17.0	137.0	49.0	21.0	37.7	59.0	3.3	26.0
Namibia	12.1	106.0	55.0	1.7	31.2	64.4	4.4	27.8
Niger	20.0	130.0	45.0	11.0	44.7	52.9	2.4	19.0
Nigeria	15.0	100.0	51.0	159.0	35.2	61.3	3.5	35.0
Rwanda	17.0	118.0	49.0	10.0	44.3	53.4	2.3	7.0
São Tomé & Principe	8.0	70.0	64.0	0.15	–	–	–	40.5
Senegal	16.0	82.0	48.0	10.0	39.6	57.9	2.5	38.0
Seychelles	8.1	13.0	67.3	0.1	–	–	–	47.2
Sierra Leone	23.4	154.0	39.4	5.0	40.5	56.3	3.2	32.2
Somalia	18.0	128.0	48.0	9.0	39.7	57.2	3.1	36.0
South Africa	10.0	68.0	62.0	45.0	25.3	67.1	7.6	59.0
Sudan	15.0	104.0	50.0	33.0	33.7	62.5	3.8	22.0
Swaziland	12.5	118.0	53.7	1.1	–	–	–	30.4
Tanzania	17.0	112.0	49.0	37.0	37.7	59.2	3.1	31.0
Togo	14.0	9.0	54.0	5.0	35.4	61.4	3.2	25.0
Tunisia	7.0	46.0	66.0	10.0	23.7	68.3	8.0	54.0
Uganda	16.0	99.0	49.0	24.0	40.6	57.0	2.4	10.0
Zaire	14.0	94.0	53.0	47.0	34.4	62.0	3.6	39.0
Zambia	13.0	76.0	54.0	11.0	38.5	58.8	2.7	49.0
Zimbabwe	7.0		64.0	13.0	25.4	68.7	5.9	27.0

(continues)

Table 1 — Population: structure and dynamics

	Area (mi²/'000)	Population (millions)	Density (inh./mi²)	Year	Population by age group, 1990 (0–14 yr)	(15–64 yr)	(over 65)	Demogr. incr. (%, 1980–89)	Birth rate (x 1000, 1989)
AMERICA									
Antigua & Barbuda	.17	0.06	386	91	–	–	–	3.1	14.1
Argentina	1,073	32.4	31	91	29.8	61.1	9.1	1.4	20.0
Bahamas	5.4	0.3	47	90	–	–	–	1.8	19.2
Barbados	.15	0.3	1,567	90	–	–	–	0.3	16.8
Belize	.01	0.18	21	87	–	–	–	1.8	36.0
Bolivia	424	7.2	18	89	42.5	54.1	3.4	2.7	42.0
Brazil	3,286	155.6	47	90	35.4	60.2	4.4	2.2	27.0
Canada	3,849	26	7	91	20.9	67.8	11.3	0.9	14.0
Chile	292	13	44	90	30.5	63.6	5.9	1.7	23.0
Colombia	441	33	75	90	35.4	60.6	4.0	2.0	25.0
Costa Rica	20	3	153	91	36.1	59.7	4.2	2.4	26.0
Cuba	43	10.6	246	89	–	–	–	1.0	17.5
Dominica	.29	0.08	285	89	–	–	–	0.3	20.8
Dominican Republic	19	7	376	89	37.3	59.3	3.4	2.3	30.0
Ecuador	110	9.6	88	90	39.5	56.9	3.6	2.7	32.0
El Salvador	8	5.2	645	85	43.7	52.7	3.6	1.4	35.0
Grenada	.13	0.1	759	88	–	–	–	2.8	32.1
Guatemala	42	8.4	199	87	45.2	51.8	3.0	2.9	39.0
Guyana	83	1	13	89	–	–	–	0.2	28.3
Haiti	11	5.7	541	89	40.0	55.9	4.1	1.9	36.0
Honduras	43	4.4	104	88	44.8	52.1	3.1	3.5	39.0
Jamaica	4	2.3	552	85	34.2	59.3	6.5	1.3	22.0
Mexico	756	81.1	106	90	37.3	59.0	3.7	2.1	28.0
Nicaragua	51	3.9	83	90	45.9	51.5	2.6	3.4	40.0
Panama	30	2.4	80	90	34.9	60.4	4.7	2.2	25.0
Paraguay	157	3.3	21	85	41.1	55.4	3.5	3.2	36.0
Peru	496	22	44	90	38.0	58.3	3.7	2.3	31.0
St. Kitts & Nevis	.10	0.04	427	90	–	–	–	3.0	22.5
St. Lucia	.23	0.1	635	90	–	–	–	2.0	24.6
St. Vincent & Grenad.	.15	0.1	718	91	–	–	–	0.1	27.0
Suriname	63	0.4	8	87	–	–	–	1.4	28.1
Trinidad & Tobago	1.93	1.2	624	90	33.9	60.6	5.5	1.7	25.0
United States	3,678	249	67	90	21.6	66.1	12.3	1.0	15.0
Uruguay	68	3.1	44	89	25.8	62.8	11.4	0.6	17.0
Venezuela	352	19.4	54	90	38.3	58.2	3.5	2.8	29.0
OCEANIA									
Australia	2,927	17.1	5	90	22.1	67.1	10.8	1.4	15.0
Fiji	7	0.7	104	90	–	–	–	1.4	26.8
Kiribati	.33	0.07	220	90	–	–	–	1.2	31.3
Marshall	.07	0.05	700	91	–	–	–	4.3	38.7
Micronesia	.03	0.1	407	91	–	–	–	–	–
Nauru	.01	0.01	1,142	89	–	–	–	0.9	21.0
New Zealand	104	3.4	31	90	22.7	66.3	11.0	0.7	16.0
Papua New Guinea	179	3.6	20	89	41.1	56.2	2.7	2.5	36.0
Samoa	1.1	0.16	150	90	–	–	–	0.8	34.0
Solomon Islands	11	0.32	30	90	–	–	–	4.0	44.5
Tonga	.29	0.1	333.4	90	–	–	–	5.0	30.4
Tuvalu	.01	0.01	984	90	–	–	–	1.2	30.0
Vanuatu	5	0.14	30	89	–	–	–	3.3	40.7

Table 1 — Population: structure and dynamics

	Mortality (x 1000, 1989)	Infant mort. (x 1000, 1989)	Life expect. (years, 1989)	Pop. in 2000 (millions)	Pop. in 2025 by age group (0–14 yr)	(15–64 yr)	(over 65)	Urban pop. (%, 1989)
AMERICA								
Antigua & Barbuda	4.6	21.2	70.0	–	–	–	–	32.0
Argentina	9.0	30.0	71.0	36.0	21.5	65.0	13.5	86.0
Bahamas	5.3	21.1	67.0	0.3	–	–	–	59.1
Barbados	8.6	13.2	71.9	0.3	–	–	–	44.7
Belize	6.0	36.0	67.0	0.23	–	–	–	51.6
Bolivia	13.0	106.0	54.0	10.0	31.1	64.6	4.3	51.0
Brazil	8.0	59.0	66.0	178.0	22.8	66.9	10.3	74.0
Canada	7.0	7.0	77.0	29.0	16.9	60.7	22.4	77.0
Chile	6.0	19.0	72.0	15.0	21.3	65.7	13.0	85.0
Colombia	6.0	38.0	69.0	38.0	22.2	67.9	9.9	69.0
Costa Rica	4.0	17.0	75.0	3.0	22.1	66.3	11.6	47.0
Cuba	6.5	11.1	72.7	11.5	–	–	–	72.8
Dominica	5.2	14.0	73.0	–	–	–	–	–
Dominican Republic	6.0	61.0	67.0	9.0	23.2	68.0	8.8	59.0
Ecuador	7.0	61.0	66.0	13.0	24.0	68.4	7.6	55.0
El Salvador	8.0	55 0	63.0	6.0	27.7	67.4	4.9	44.0
Grenada	8 1	15.9	69.0	–	–	–	–	–
Guatemala	8.0	55.0	63.0	12.0	28.9	66.4	4.7	39.0
Guyana	7.3	41.0	64.0	0.8	–	–	–	31.1
Haiti	13.0	94 0	55.0	8.0	31.0	64.0	5.0	28.0
Honduras	8.0	66.0	65 0	7.0	28.1	66.9	5.0	43.0
Jamaica	7.0	16.0	73.0	3.0	20.9	67.9	11.2	52.0
Mexico	6.0	40.0	69.0	105 0	22.9	68.3	8.8	72.0
Nicaragua	7.0	57.0	64.0	5.0	28 4	66.4	5.2	59.0
Panama	5.0	22.0	73.0	3.0	21.9	67.2	10.9	53.0
Paraguay	6 0	32 0	67 0	6.0	30.2	63.7	6.1	47.0
Peru	9.0	79.0	62.0	26.0	23.8	68.4	7.8	70.0
St. Kitts & Nevis	11.0	22.2	64.0	–	–	–	–	45.0
St. Lucia	6.0	15.9	68 3	0.2	–	–	–	46.4
St. Vincent & Grenad.	6.0	23.3	69.0	0.13	–	–	–	25.7
Suriname	6.2	33.0	63.4	0.5	–	–	–	65.2
Trinidad & Tobago	6.0	15.0	71.0	1.3	22.2	65.8	12.0	68.0
United States	9.0	10.0	76.0	270.0	18.0	61.1	20.9	75.0
Uruguay	10.0	22.0	73.0	3.0	20.0	63.9	16.1	85.0
Venezuela	5.0	35.0	70.0	24.0	23.3	67.5	9.2	84.0
OCEANIA								
Australia	7.0	8.0	77.0	20.0	18.1	63 0	18.9	86.0
Fiji	5.0	27.0	68.3	0.9	–	–	–	38.7
Kiribati	8.1	110.0	51.0	–	–	–	–	34.8
Marshall Islands	5.2	30.3	71.0	–	–	–	–	–
Micronesia	–	–	–	–	–	–	–	–
Nauru	5.0	41.0	64.0	–	–	–	–	–
New Zealand	8.0	10.0	74.0	4.0	18.7	62.7	18.6	84.0
Papua New Guinea	11.0	59.0	54.0	5.0	27.6	67.8	4.6	16.0
Samoa	7.0	48.0	64.0	0.18	–	–	–	21.2
Solomon Islands	9.9	74.0	60.0	0.43	–	–	–	15.7
Tonga	7.2	49.0	61.0	0.10	–	–	–	30.7
Tuvalu	10.0	35.0	60.0	–	–	–	–	34.2
Vanuatu	7.8	55.0	61.0	0.19	–	–	–	18.4

Table 2 — Population: social indicators

	Food (daily cal. per capita, 1989)	Energy (bbl petrol. per capita, 1990)	Health (pop. per physician, 1988)	Illiteracy (%, 1991)	Student distribution, 1991 (Preschool)	(Primary level)	(Secondary level)	(Higher level)	Education (% of public expend., 1990)
EUROPE									
Albania	2,657	7.25	574	25.0	125,312 (a)	550,656 (a)	202,864 (a)	22,059	–
Andorra	–	–	441	–	1,925	3,453	2,516	–	24.4
Austria	3,478	22.03	390	0.0	192,946	367,006	601,140	199,845	12.8
Belgium	3,942	17.66	330	1.0	371,509 (a)	728,718 (c)	805,647 (c)	254,329 (c)	1.7
Bulgaria	3,650	31.10	324	4.5	317,559	991,626	397,362	157,861	–
ex Czechoslovakia	3,540	31.96	317	1.0	636,622	1,961,742	856,971	186,142	–
Denmark	3,577	22 76	400	1.0	51,814 (b)	355,311	483,502 (b)	126,662 (b)	1 2
Finland	3,170	35.54	440	1.0	49,772	389,067	410,582	155,313	10.6
France	3,310	24.19	320	1.2	2,535,955 (b)	4,163,161	5,398,599	1,587,202	21.0
Germany	3,514	–	380	1.0	1,645,959 (b)	2,473,700	6,219,158 (b)	1,686,725 (b)	18 3
Germany (*ex GFR*)	–	21.96	–	–	–	–	–	–	–
Great Britain (UK)	3,252	22.93	–	1 0	716,000	4,414,966	4,365,912	1,113,341	14 3
Greece	3,699	13 16	350	6.8	155,246	868,335	840,020	189,173	–
Hungary	3,601	20 20	310	1.1	392,273	1,183,573	487,208	100,868	2 1
Iceland	3,661	–	373	1.0	4,355	25,525	29,059	5,407	24 9
Ireland	3,699	16.69	680	1.0	135,923	423,662	341,800	81,133	12 4
Italy	3,566	17 32	230	3.0	1,566,364	3,140,113	5,245,132	1,358,254	11 3
Lichtenstein	–	–	948	–	–	1,754	1,707	–	–
Luxembourg	3,901	–	527	0.0	7,965	23,375 (c)	2,246 (c)	709 (d)	2.2
Malta	3,258	–	451	4.0	11,322	36,726	30,210	1,682	9 4
Monaco	–	–	366	–	887	1,796	2,909	–	–
Netherlands	3,354	32.22	450	1.0	399,453 (f)	1,428,577	1,289,368	415,847	11.6
Norway	2,848	57.13	660	0 0	128,237	310,600	375,095	114,855 (b)	10 6
Poland	3,451	21.49	490	1.3	1,316,699	5,141,434	1,829,747	505,727	–
Portugal	3,382	9 48	410	16 0	128,877	1,003,569	544,943	156,701	8 2
Romania	3,357	22 79	570	2.0	835,890	2,891,810	1,652,442	164,507	51 0
San Marino	–	–	375	–	773	1,227	1,204	–	10.3
Spain	3,543	13.84	320	7.2	1,054,241 (c)	3,246,655 (c)	4,798,337 (c)	1,036,439 (c)	12.5
Sweden	3,007	39.92	390	0.5	307,816	578,540	597,971	184,815	1.0
Switzerland	3,547	24.54	700	1.0	136,845	394,061	371,097	132,753	–
ex USSR	3,382	–	–	1.0	12,718,000	25,040,000	21,124,000	527,300	–
- Estonia	3,386	–	218	1.0	–	–	–	–	–
- Georgia	–	–	169	–	–	–	–	–	–
- Latvia	3,386	–	201	1.0	–	–	–	–	–
- Lithuania	3,386	–	217	1.0	–	–	–	–	–
CIS									
- Armenia	–	–	233	–	–	–	–	–	–
- Azerbaijan	–	–	254	–	–	–	–	–	–
- Belarus	–	–	247	–	–	–	–	–	–
- Kazakhstan	–	–	243	–	–	–	–	–	–
- Kyrgyzstan	–	–	272	–	–	–	–	–	–
- Moldova	–	–	250	–	–	–	–	–	–
- Russia	–	–	213	–	–	–	–	–	–
- Tajikistan	–	–	369	–	–	–	–	–	–
- Turkmenistan	–	–	280	–	–	–	–	–	–
- Ukraine	–	–	227	–	–	–	–	–	–
- Uzbekistan	–	–	279	–	–	–	–	–	–
Vatican City	–	–	–	–	–	–	–	9,775	–

(continues)

Table 2 — Population: social indicators

	Food (daily cal. per capita, 1989)	Energy (bbl petrol. per capita, 1990)	Health (pop. per physician, 1988)	Illiteracy (%, 1991)	Student distribution, 1991 (Preschool)	(Primary level)	(Secondary level)	(Higher level)	Education (% of public expend., 1990)
ex Yugoslavia	3,505	15.15	–	–	435,932	1,406,630	2,361,660	342,643	–
- Bosnia-Herzegovina	–	–	555	14.5	–	–	–	–	–
- Croatia	–	–	385	5.6	–	–	–	–	–
- Macedonia	–	-	417	10.9	–	–	–	–	–
- Slovenia	–	–	385	0.8	–	–	–	–	–
- Yugoslavia (Fed. Rep.)	–	–	500	10.2	–	–	–	–	..
ASIA									
Afghanistan	2,110	0.57	4,797	76.3	19,660 (b)	726,287	136,898	19,509 (c)	–
Bahrain	–	–	713	22.6	8,994	63,179	41,038	4,894 (c)	7.7
Bangladesh	1,925	0.36	6,730	64.7	2,317,181 (b)	11,285,445	3,340,120 (b)	370,900	–
Brunei	2,839	–	1,469	15.0	8,634	39,862	17,527 (c)	945	3.4
Cambodia	2,162	0.37	27,000	52.0	35,495	1,504,843	145,730	586	–
China	2,632	3.76	1,010	27.4	18,476,600	123,731,000	50,541,400	2,173,112	–
Cyprus	3,054	–	484	5.5	22,008	60,841	43,219	5,852	6.7
Hong Kong	2,883	10.80	933	12.0	214,700 (b)	534,309 (c)	458,444 (c)	76,844 (f)	9.4
India	2,104	1.45	2,520	51.8	1,353,023	97,318,114	30,531,881	4,470,844 (e)	1.7
Indonesia	2,670	1.71	9,460	22.4	1,568,450	30,130,564	11,693,361	980,162 (f)	1.8
Iran	3,100	6.45	2,840	38.2	217,496	8,817,145	4,668,442	315,657 (b)	7.1
Iraq	2,962	4.87	1,740	54.1	85,096	3,023,132	1,166,859	209,818	–
Israel	3,138	12.89	350	8.2	318,160	702,472	291,754	117,454	3.9
Japan	2,848	22.41	660	1.0	2,037,614	9,606,627	11,143,930	2,683,035	–
Jordan	2,907	6.25	1,120	20.0	42,223	590,275	384,279	65,974 (b)	4.1
Korea, North	3,172	11.94	370	10.0	728,000	1,543,000	2,468,000	390,000	–
Korea, South	2,878	–	1,160	7.3	414,532	4,868,520	4,559,557	1,691,429	2.0
Kuwait	3,132	40.34	640	25.0	52,105	185,464	265,001	26,080	7.4
Laos	2,637	0.25	1,360	16.1	27,298	558,852	135,583	5,322	–
Lebanon	3,275	6.09	771	23.0	129,590	399,029	287,310	70,510 (f)	3.1
Malaysia	2,686	6.13	1,930	27.4	331,520	2,397,816	1,480,490	108,091 (b)	–
Maldives	2,140	–	7,732	9.6	2,327	39,775	2,756 (g)	–	8.0
Mongolia	2,841	8.03	390	10.5	61,668 (d)	166,200	273,900 (f)	39,072 (d)	–
Myanmar (Burma)	2,572	0.52	3,740	21.5	–	5,046,471	1,358,788	202,381	5.0
Nepal	2,078	0.16	30,220	79.3	16,864 (f)	2,108,739	612,943	95,240	5.0
Oman	–	16.66	1,700	59.0	3,050	247,128	85,230	4,285 (b)	5.1
Pakistan	2,200	1.47	2,910	74.4	–	8,614,857	3,637,466	315,793 (c)	–
Philippines	2,260	1.35	1,090	11.3	321,459	10,284,861	3,961,639	1,579,938 (b)	6.0
Qatar	–	–	568	24.3	6,105	49,657	28,685	6,469	0.8
Saudi Arabia	2,832	31.65	740	42.8	68,426	1,694,394	654,202 (d)	123,848	–
Singapore	2,892	35.76	1,310	12.4	17,858	257,833	180,817	35,192 (g)	5.2
Sri Lanka	2,319	1.13	5,520	14.0	–	2,114,800	1,088,089	61,628 (d)	6.2
Syria	3,168	5.74	1,260	–	75,374 (b)	2,357,981	923,532	205,866	1.2
Taiwan	2,749	–	965	7.8	–	2,313,240	1,250,840	428,576	1.4
Thailand	2,287	2.21	6,290	11.2	84,763 (a)	6,676,562	2,071,107 (a)	952,012	6.3
Turkey	3,080	5.39	1,390	24.0	112,053	6,848,083	3,620,982	685,500	2.9
United Arab Emirates	3,552	68.40	1,020	27.0	47,007	215,532	95,669	7,655 (b)	6.9
Vietnam	2,277	0.63	3,140	12.4	1,701,681	8,125,836	3,200,912	114,701	–
Yemen	2,322	1.47	–	81.1	322	1,291,372	420,697	23,457 (b)	–
AFRICA									
Algeria	2,726	12.30	2,340	42.5	–	4,189,152	2,162,469 (a)	180,756 (b)	–

(continues)

Table 2 — Population: social indicators

	Food (daily cal. per capita, 1989)	Energy (bbl petrol. per capita, 1990)	Health (pop. per physician, 1988)	Illiteracy (%, 1991)	Student distribution, 1991 (Preschool)	(Primary level)	(Secondary level)	(Higher level)	Education (% of public expend., 1990)
Angola	1,725	1.28	17,790	72.0	191,882	1,038,126	170,280	4,493 (f)	–
Benin	2,145	0.29	15,940	73.0	13,433 (b)	482,451 (b)	102,171 (d)	8,883	–
Botswana	2,251	2.67	7,185	29.2	–	296,370	44,306 (b)	2,731 (e)	5.5
Burkina Faso	2,061	0.11	26,525	81.8	7,655	472,979	91,336	4,498 (b)	5.2
Burundi	2,253	0.13	21,030	50.0	2,140 (c)	560,095 (b)	31,413 (c)	3,080	–
Cameroon	2,161	0.92	–	43.0	92,966	1,946,301	457,161	26,783 (b)	3.4
Cape Verde	2,550	–	4,208	52.6	4,523	65,377 (a)	7,008	–	–
Central African Rep.	1,980	0.19	–	62.3	11,677 (c)	297,457	45,340	3,075	–
Chad	1,852	0.11	38,360	82.2	–	492,231	58,570 (b)	2,983 (b)	–
Comoros	2,059	–	11,237	53.7	17,778	64,737 (c)	21,168 (d)	–	6.5
Congo	2,512	1.34	–	43.4	5,983	492,595	200,466 (b)	10,310 (b)	–
Djibouti	–	–	5,427	0.0	220	31,378	8,902 (b)	–	8.2
Egypt	3,213	3.76	770	51.6	177,740	6,155,100	4,998,615	764,539 (b)	2.5
Equatorial Guinea	–	–	61,000	68.5	–	61,532	4,368 (h)	1,140 (i)	–
Ethiopia	1,658	0.13	78,770	95.2	87,355 (b)	2,855,846 (b)	882,243 (b)	25,562	3 6
Gabon	2,396	7.28	2,790	39.3	–	195,049 (c)	48,274 (c)	4,077	–
Gambia	2,339	–	9,900	72.8	–	75,177	15,913	–	8.0
Ghana	2,209	0.43	20,460	39.6	323,406	1,703,074	793,388	16,350 (i)	9.0
Guinea	2,042	0.46	–	71.7	–	310,064	78,659	5,923 (c)	–
Guinea-Bissau	2,543	–	7,164	63.5	754	79,035 (b)	6,330 (b)	404 (b)	5.4
Ivory Coast	2,365	1.09	–	46.2	8,570	1,214,511	266,801 (f)	19,660 (f)	–
Kenya	1,973	0.63	10,050	40.8	660,473 (e)	5,123,581 (b)	563,440 (b)	31,287	5 9
Lesotho	2,307	–	18,610	26.4	–	351,632	47,212 (a)	5,577 (b)	–
Liberia	2,270	1.06	9,350	77.6	70,507 (f)	80,048 (d)	54,623	5,095	–
Libya	3,384	21.38	690	36.2	15,028 (e)	788,780 (e)	430,885 (e)	30,000 (e)	–
Madagascar	2,101	0.25	9,780	19.8	–	1,512,322	348,922	37,046	–
Malawi	2,009	0.26	11,340	58.8	–	1,212,836 (b)	29,588	4,951	73.0
Mali	2,181	0.15	25,390	89.9	–	324,369	66,431 (c)	5,536 (d)	2 1
Mauritania	2,528	0.72	11,900	72.0	–	158,800	39,154	5,808	–
Mauritius	2,679	2.48	1,900	17.0	10,617 (h)	137,929	78,776	2,179	9.2
Morocco	2,820	1.55	4,760	29.3	787,472	2,163,185	1,336,999	239,923 (a)	3.0
Mozambique	1,632	0.53	–	83.4	45,100 (d)	1,287,681	116,928	2,335	–
Namibia	2,183	–	4,450	27.5	–	–	–	–	–
Niger	2,340	0.25	39,670	86.1	11,038	344,848 (a)	65,816 (b)	4,506 (a)	–
Nigeria	2,039	0.87	6,440	57.6	–	12,712,087	2,723,791	266,508 (d)	–
Rwanda	1,786	0.26	35,090	50.6	8,000 (c)	1,058,529	65,323	3,389	–
São Tomé & Príncipe	2,529	–	2,813	–	–	–	–	–	–
Senegal	1,989	0.98	–	77.5	15,964	682,925	173,044	13,354 (e)	–
Seychelles	2,117	–	1,397	42.7	3,456	14,595	4,052	144	13.1
Sierra Leone	1,813	0.48	13,150	79.3	–	399,018	101,056	2,334 (o)	7.5
Somalia	1,736	0.40	16,080	45.2	1,358 (e)	196,496 (e)	45,686 (e)	15,672 (d)	–
South Africa	3,035	15.39	–	20.7	–	5,045,000	1,747,000	247,696	–
Sudan	1,996	0.36	10,190	78.4	235,943 (e)	1,766,738 (d)	556,587 (e)	60,134	–
Swaziland	2,554	–	7,971	32.2	1,880	157,208	33,670 (c)	2,363 (c)	9.1
Tanzania	2,151	0.24	24,980	15.0	–	3,258,601	145,748	5,254	–
Togo	2,113	0.32	8,700	60.9	10,483 (c)	569,388	109,791	7,456 (b)	5.2
Tunisia	2,964	3.27	2,150	34.7	43,768	1,376,519	546,953	62,658	5.9
Uganda	2,013	0.17	–	51.7	–	2,632,764	260,069	14,194	–
Zaire	2,034	0.45	12,940	38.8	–	4,356,516	1,066,351	61,422	4.3

(continues)

Table 3 — Population: social indicators

	Food (daily cal. per capita, 1989)	Energy (bbl petrol. per capita, 1990)	Health (pop. per physician, 1988)	Illiteracy (%, 1991)	Student distribution, 1991 (Preschool)	(Primary level)	(Secondary level)	(Higher level)	Education (% of public expend., 1990)
Zambia	2,026	2.38	7,150	31.4	6,022	1,426,135 (b)	170,299 (b)	14,465	7.4
Zimbabwe	2,232	3.30	6,700	24.0	–	2,214,939 (a)	651,771 (a)	49,361	7.6
AMERICA									
Antigua & Barbuda	2,178	–	1,606	42.5	677 (g)	11,394	29,765	–	2.5
Argentina	3,118	11.33	370	4.7	798,235 (b)	4,998,963 (b)	1,862,325 (c)	958,542 (c)	2.0
Bahamas	2,680	–	809	5.0	–	29,518 (d)	29,765 (d)	5,305	13.4
Barbados	3,188	–	1,042	2.0	3,052 (h)	30,161 (f)	28,695 (f)	5,227 (f)	11.0
Belize	2,627	–	1,997	7.0	2,100	40,729	7,560	113	3.3
Bolivia	2,086	1.62	1,540	22.5	112,086	1,225,843	207,824	140,890	6.6
Brazil	2,709	5.76	1,080	18.9	3,530,000	27,640,000	3,441,000	1,518,904	6.1
Canada	3,447	62.96	510	4.4	475,000	2,345,000	2,254,654	1,322,917	5.5
Chile	2,584	5.58	1,230	6.6	278,443 (a)	1,991,178	742,010 (a)	234,973 (b)	5.9
Colombia	2,561	5.10	1,240	14.0	328,425	4,205,657	2,282,816	474,787	–
Costa Rica	2,782	3.91	960	7.0	43,641	422,102	123,052	77,576	21.2
Cuba	3,103	–	303	6.0	143,705 (b)	885,576	1,073,119	243,366	–
Dominica	2,884	–	2,619	5.6	2,192 (a)	12,600	6,308 (d)	68 (b)	5.7
Dominican Republic	2,357	2.11	1,760	18.0	22,237	1,032,055	463,511 (e)	123,748 (e)	–
Ecuador	2,338	4.26	820	14.0	108,348 (c)	1,822,252 (c)	771,928 (c)	206,541	9.8
El Salvador	2,415	1.47	2,830	30.0	72,238 (b)	1,016,181	95,078	80,818	7.4
Grenada	2,959	–	1,855	15.0	3,584	20,976	6,497	535 (g)	6.9
Guatemala	2,352	1.08	2,180	53.0	144,312 (c)	1,149,134	241,083 (c)	51,860 (d)	–
Guyana	2,423	–	6,809	3.6	25,316 (d)	112,581 (d)	76,012 (d)	3,700	5.7
Haiti	1,911	0.33	7,130	53.0	21,000 (f)	780,660 (c)	143,758 (e)	6,288 (e)	–
Honduras	2,164	1.25	1,510	29.0	52,831 (d)	863,313 (b)	179,444 (d)	44,849 (a)	–
Jamaica	2,572	5.86	2,050	1.6	136,671	339,023	241,000 (b)	12,054 (d)	–
Mexico	3,135	8.18	1,242	12.0	2,734,068	14,508,116	6,704,647	1,314,027 (a)	1.7
Nicaragua	2,361	1.64	1,500	13.0	64,916	595,612	161,212	26,878 (c)	–
Panama	2,468	10.66	1,000	12.0	32,046 (e)	350,277	190,166	51,086 (b)	19.8
Paraguay	2,816	1.46	1,460	9.9	30,019	656,877	155,434	31,117	3.0
Peru	2,269	3.20	1,040	15.0	603,757	4,019,483	1,746,182	743,569	5.5
St. Kitts & Nevis	2,282	–	1,593	10.0	1,618	7,473	4,197 (f)	194 (e)	3.0
St. Lucia	2,760	–	2,636	10.0	4,500	33,148	7,013 (d)	384 (e)	–
St. Vincent & Grenad.	2,764	–	2,874	–	–	–	–	–	–
Suriname	2,775	–	1,798	–	16,570 (d)	61,570 (b)	35,878 (d)	3,402 (d)	3.7
Trinidad & Tobago	2,960	37.36	950	4.0	5,049	189,623	99,615 (c)	6,282 (e)	–
United States	3,666	46.80	470	4.5	6,515,000 (d)	27,117,000 (d)	13,913,000 (d)	13,824,592	12.9
Uruguay	2,770	5.16	510	3.8	61,187 (b)	351,984 (b)	243,135 (b)	32,627	4.5
Venezuela	2,547	16.24	700	11.9	555,933 (b)	2,967,110 (d)	1,138,916 (b)	500,295 (b)	–
OCEANIA									
Australia	3,322	31.71	440	0.5	179,344	1,555,230	1,276,969	441,076	9.9
Fiji	2,785	–	2,649	13.0	5,400 (d)	143,552	46,457 (d)	2,313 (e)	9.1
Kiribati	2,952	–	4,104	10.0	–	14,709	2,903 (a)	–	19.9
Marshall Islands	–	–	2,226	13.7	–	–	–	–	–
Micronesia	–	–	–	–	–	–	–	–	–
Nauru	–	–	700	1.0	383	1,451	482	–	–
New Zealand	3,393	31.27	522	0.0	73,390	312,773	341,249	120,821	12.7
Papua New Guinea	2,236	1.47	6,070	57.7	1,108	417,818	67,007	6,397 (d)	9.4

(continues)

Table 2 — Population: social indicators

	Food (daily cal. per capita, 1989)	Energy (bbl petrol. per capita, 1990)	Health (pop. per physician, 1988)	Illiteracy (%, 1991)	Student distribution, 1991 (Preschool)	(Primary level)	(Secondary level)	(Higher level)	Education (% of public expend., 1990)
Samoa	2,474	–	3,685	1.0	2,324	37,833	20,604 (d)	562 (g)	16.7
Solomon Islands	2,140	–	9,852	45.9	–	39,563	1,144	–	4.7
Tonga	2,964	–	2,130	7.2	568	16,522	14,749	705 (e)	4.2
Tuvalu	–	–	2,141	4.5	–	1,364	265 (i)	–	–
Vanuatu	2,533	–	7,948	7.1	1,092 (i)	24,471	2,904 (g)	–	5.5

(a) = 1989; (b) = 1988; (c) = 1987; (d) = 1986; (e) = 1985; (f) = 1984; (g) = 1983; (h) = 1982; (i) = 1981

Table 3 — Economic summary: labor and growth

	Econ. active population (%, 1986)	GNP (US$'000, 1990)	Per cap. GNP (US$, 1990)	GNP distribution (%) per economic sector, 1990 (primary)	(secondary)	(tertiary)	Inflation (avg. rate, (1980–89)	Consumer price changes (1985 = 100)	Year
EUROPE									
Albania	74.50	2.40	730	35.0	40.0	25.0	-	–	–
Andorra	74.30	0 70	14,000	–	–	–	–	–	–
Austria	66.60	159.10	20,900	4 4	39 3	56 3	3.8	111.3	90
Belgium	68.00	194.80	19,620	2.0	31.0	67.0	4.5	111 0	90
Bulgaria	66.00	40 00	4,500	16.0	52 0	32.0	1 4	106 7	89
ex Czechoslovakia	88.20	49 22	3,140	8.0	60.0	32.0	1.6	112 3	90
Denmark	83.00	130.90	25,570	5.5	27.0	67 5	6.0	124 1	91
Finland	76.60	139.30	28,140	6 1	29.5	64.4	7 0	132.6	91
France	65.50	1,191.40	21,230	3.3	29.6	67.1	6.5	120.0	91
Germany	–	–	–	3.0	45.0	52.0	–	–	–
Germany (*ex GFR*)	67.90	1,490.20	24,000	–	–	–	2 7	130.2	91
Great Britain (UK)	75.60	978.40	17,160	2.0	38.0	60.0	6.1	133.4	89
Greece	65.00	68.00	6,800	16.0	27.0	57.0	18.2	264.7	91
Hungary	77.50	40.50	3,850	15.0	40.0	45.0	7.5	198 7	90
Iceland	80.00	5.70	22,800	16.0	36.0	48.0	34.8	268.9	91
Ireland	59.20	42.80	11,890	9.6	35.0	55.4	7.8	121.4	91
Italy	59.10	1,089.10	18,920	6.0	39.0	55.0	10 3	131.7	90
Lichtenstein	68.60	1.02	34,000	–	–	–	–	120.9	90
Luxembourg	60.60	8.80	23,340	2.4	31.6	64.0	4.4	109.0	90
Malta	45.90	2.34	6,400	4.0	31.0	65.0	2.0	107.4	90
Monaco	64.60	0.70	23,000	–	–	–	–	–	–
Netherlands	66.70	276.90	18,640	5.1	33.7	61.2	1.9	107.7	91
Norway	77.60	105.80	24,950	5.0	34.0	61.0	5.6	140.0	91
Poland	82.40	143.80	3,770	18.0	53.0	29.0	38.1	9,680.2	91
Portugal	68.90	59.10	5,630	9.0	40.0	51.0	19.1	190.3	91
Romania	66.00	78.00	3,400	20.0	60.0	20.0	–	274.4	91
San Marino	91.20	0.50	20,000	–	–	–	–	–	–
Spain	64.00	491.10	12,510	4.9	34.4	59.7	9.4	144.9	91
Sweden	82.30	230.20	27,180	2.6	30.0	67.4	7.4	147.8	91
Switzerland	62.90	223.40	33,340	3.5	39.5	57.0	3.6	119.8	91
ex USSR	82.20	–	–	–	–	–	–	114.0	90
Estonia	–	2.80	1,867	20.2	61.0	18.8	–	146.0	90
Georgia	–	6.40	1,185	–	–	–	–	–	–

(continues)

Table 3 — Economic summary: labor and growth

	Econ. active population (%, 1986)	GNP (US$'000, 1990)	Per cap. GNP (US$, 1990)	GNP distribution (%) per economic sector, 1990 (primary)	(secondary)	(tertiary)	Inflation (avg. rate, (1980–89)	Consumer price changes (1985 = 100)	Year
- Latvia	–	4.40	1,692	–	–	–	–	107.7	89
- Lithuania	–	5.60	1,514	–	–	–	–	–	–
CIS									
- Armenia	–	3.60	1,091	–	–	–	–	–	–
- Azerbaijan	–	6.80	958	–	–	–	–	–	–
- Belarus	–	16.80	1,647	–	–	–	–	–	–
- Kazakhstan	–	17.20	1,035	–	–	–	–	–	–
- Kyrgyzstan	–	3.20	744	–	–	–	–	–	–
- Moldova	–	4.80	1,116	–	–	–	–	–	–
- Russia	–	244.00	1,649	–	–	–	–	–	–
- Tajikistan	–	3.20	615	–	–	–	–	–	–
- Turkmenistan	–	3.20	889	–	–	–	–	–	–
- Ukraine	–	64.80	1,251	–	–	–	–	–	–
- Uzbekistan	–	13.20	650	–	–	–	–	–	–
ex Yugoslavia	68.00	-	–	–	–	–	96.9	245,183.0	88
- Bosnia-Herzegovina	–	13.32	3,000	8.0	55.0	37.0	–	–	–
- Croatia	–	32.80	7,000	5.0	45.0	50.0	–	–	–
- Macedonia	-	7.00	3,500	14.0	47.0	39.0	–	–	–
- Slovenia	–	19.00	10,000	-	–	–	–	–	–
- Yugoslavia (Fed. Rep.)	–	41.35	4,000	11.0	45.0	44.0	–	–	–
ASIA									
Afghanistan	49.10	5.50	330	33.0	7.0	60.0	–	344.7	90
Bahrain	65.30	3.90	7,040	1.2	43.9	54.9	–	98.6	90
Bangladesh	53.00	22.58	200	38.0	20.0	42.0	10.6	158.1	90
Bhutan	55.00	0.27	190	50.0	18.0	32.0	–	140.0	89
Brunei	61.10	5.04	19,400	2.0	76.0	22.0	–	10,570.0	89
Cambodia	71.40	1.56	190	80.0	5.0	15.0	–	–	–
China	76.80	416.00	370	31.0	49.0	20.0	5.8	163.4	–
Cyprus	62.20	4.76	6,800	8.0	27.0	65.0	6.0	122.6	91
Hong Kong	63.10	70.00	12,180	1.0	26.0	73.0	7.1	140.8	90
India	56.00	294.81	350	30.0	30.0	40.0	7.7	149.7	90
Indonesia	68.60	101.15	560	20.0	38.0	42.0	8.3	142.9	90
Iran	51.30	139.12	2,450	18.0	34.0	48.0	13.5	258.0	90
Iraq	43.10	31.00	1,750	15.0	40.0	45.0	–	140.2	88
Israel	51.50	50.87	10,970	9.0	41.0	50.0	117.1	366.0	90
Japan	63.30	2,894.00	23,340	3.0	40.1	56.9	1.3	110.4	91
Jordan	39.00	3.60	1,150	5.0	20.0	75.0	–	155.4	90
Korea, North	61.80	23.10	1,064	25.0	35.0	40.0	–	130.2	90
Korea, South	61.80	237.00	5,530	8.0	41.0	51.0	5.0	219.0	90
Kuwait	56.10	20.00	10,000	1.0	45.0	54.0	−2.7	106.6	89
Laos	84.20	0.85	200	61.0	9.0	30.0	–	–	–
Lebanon	39.90	2.60	960	10.0	15.0	75.0	–	1,030.0	87
Malaysia	66.30	41.36	2,390	18.0	40.0	42.0	1.5	109.3	90
Maldives	50.20	0.13	641	12.0	14.0	74.0	6.4	–	–
Mongolia	82.20	0.70	300	18.0	32.0	50.0	–	99.0	89
Myanmar (Burma)	54.00	9.13	220	32.0	15.0	53.0	2.1	236.8	90
Nepal	82.95	3.15	170	40.0	25.0	35.0	9.1	169.2	90
Oman	60.90	10.80	7,200	3.0	58.0	39.0	−6.0	125.0	90

(continues)

Table 3 — Economic summary: labor and growth

	Econ. active population (%, 1986)	GNP (US$/'000, 1990)	Per cap. GNP (US$, 1990)	GNP distribution (%) per economic sector, 1990 (primary)	(secondary)	(tertiary)	Inflation (avg. rate, 1980–89)	Consumer price changes (1985 = 100)	Year
Pakistan	53.30	41.00	366	23.0	28.0	49.0	6.7	147.8	91
Philippines	66.00	46.20	750	24.0	33.0	43.0	14.8	166.8	91
Qatar	76.00	6.20	16,550	1.0	52.0	47.0	–	116.1	90
Saudi Arabia	51.50	98.00	6,853	4.0	65.0	31.0	–4.4	99.2	90
Singapore	63.10	33.60	12,460	1.0	29.0	70.0	1.5	110.2	91
Sri Lanka	61.50	8.28	490	27.0	27.0	46.0	13.5	201.6	91
Syria	46.70	12.40	990	16.0	40.0	44.0	15.0	388.4	90
Taiwan	73.30	159.50	7,895	4.0	49.0	47.0	–	115.5	90
Thailand	76.20	79.80	1,395	16.0	33.0	51.0	3.2	121.0	90
Turkey	61.60	107.90	1,950	15.4	38.9	47.7	41.4	857.9	90
United Arab Emirates	76.70	32.80	18,767	1.0	51.0	48.0	1.1	–	–
Vietnam	79.90	13.40	200	48.0	27.0	25.0	–	–	–
Yemen	41.20	7.00	610	20.0	33.0	47.0	–	–	–
AFRICA									
Algeria	44.30	51.58	2,060	12.0	45.0	43.0	5.2	163.0	90
Angola	71.80	7.50	750	13.0	55.0	32.0	–	–	–
Benin	49.00	1.98	421	36.0	16.0	48.0	7.5	–	–
Botswana	48.00	2.75	2,200	3.0	55.0	42.0	12.0	181.8	91
Burkina Faso	44.00	3.30	370	38.0	24.0	38.0	4.6	97.8	90
Burundi	52.00	1.15	210	55.0	15.0	29.0	3.7	136.3	90
Cameroon	50.00	12.00	1,090	24.0	31.0	45.0	6.6	124.0	89
Cape Verde	60.00	0.33	890	15.0	18.0	67.0	9.7	115.0	87
Central African Rep.	55.00	1.30	440	41.0	19.0	40.0	6.5	91.0	90
Chad	51.20	1.17	207	54.0	14.0	32.0	1.5	90.3	90
Comoros	53.10	0.23	480	37.0	13.0	50.0	5.3	–	–
Congo	51.00	2.29	1,010	10.0	38.0	52.0	0.3	113.1	89
Djibouti	65.20	0.50	1,250	3.0	12.0	85.0	–	104.0	83
Egypt	55.00	31.38	600	19.0	28.0	53.0	11.0	247.0	90
Equatorial Guinea	–	0.13	310	60.0	5.0	35.0	–	78.0	90
Ethiopia	43.10	6.04	120	42.0	18.0	40.0	2.0	106.8	90
Gabon	58.00	3.80	3,450	9.0	51.0	40.0	–0.1	110.0	90
Gambia	78.20	0.23	260	35.0	11.0	54.0	14.1	262.5	90
Ghana	48.00	5.82	390	37.0	30.0	33.0	43.6	393.2	90
Guinea	52.00	2.76	480	30.0	35.0	35.0	–	160.1	90
Guinea-Bissau	41.00	0.15	155	60.0	9.0	31.0	–	78.0	89
Ivory Coast	54.00	8.92	730	29.0	17.0	54.0	9.4	115.3	88
Kenya	45.00	8.95	370	31.0	20.0	49.0	9.0	145.3	90
Lesotho	79.80	0.85	485	18.4	33.7	47.9	12.8	188.2	90
Liberia	52.00	0.70	250	35.0	30.0	35.0	1.1	119.8	88
Libya	50.00	27.88	6,060	3.0	77.0	20.0	0.2	–	–
Madagascar	51.00	2.71	230	41.0	15.0	44.0	17.8	203.6	90
Malawi	84.60	1.76	212	37.0	18.0	45.0	14.6	240.3	90
Mali	48.30	2.45	302	53.0	13.0	34.0	3.6	109.2	90
Mauritania	69.80	1.00	500	38.0	19.0	43.0	9.4	141.7	90
Mauritius	63.00	2.44	2,300	20.0	30.0	50.0	8.3	142.6	90
Morocco	52.00	23.79	950	13.0	30.0	57.0	7.4	126.0	90
Mozambique	51.00	1.20	85	40.0	30.0	30.0	34.9	1,145.0	90
Namibia	–	1.95	1,392	16.0	30.0	54.0	–	217.9	90

(continues)

Table 3 — Economic summary: labor and growth

	Econ. active population (%, 1986)	GNP (US$'000m, 1990)	Per cap. GNP (US$, 1990)	GNP distribution (%) per economic sector, 1990 (primary)	(secondary)	(tertiary)	Inflation (avg. rate, 1980–89)	Consumer price changes (1985 = 100)	Year
Niger	78.90	2.30	300	27.0	17.0	36.0	3.4	85.8	90
Nigeria	55.70	31.28	270	32.0	25.0	43.0	14.2	293.7	90
Rwanda	77.70	2.20	310	37.0	23.0	40.0	4.0	133.5	91
São Tomé & Principe	61.10	0.05	880	70.0	5.0	25.0	–	–	–
Senegal	46.20	4.80	665	22.0	26.0	52.0	7.3	100.7	90
Seychelles	66.80	–	4,670	–	15.0	–	3.4	112.7	91
Sierra Leone	62.90	0.64	160	40.0	19.0	41.0	54.1	2,296.2	90
Somalia	63.10	0.95	150	64.0	10.0	26.0	42.8	316.6	88
South Africa	55.00	102.00	2,680	5.0	44.0	51.0	14.1	235.0	91
Sudan	52.00	3.80	150	37.0	15.0	48.0	–	403.9	89
Swaziland	44.10	0.65	789	27.0	29.0	44.0	11.9	140.3	88
Tanzania	75.00	2.77	120	54.0	7.0	39.0	26.1	358.4	90
Togo	69.50	1.47	410	30.0	23.0	47.0	5.1	104.2	90
Tunisia	52.90	12.75	1,560	18.0	32.0	50.0	7.5	149.7	91
Uganda	78.90	3.81	220	81.0	4.0	15.0	108.1	4,900.0	89
Zaire	57.00	8.12	230	38.0	17.0	45.0	59.0	1,888.4	90
Zambia	48.00	3.39	420	14.0	39.0	47.0	38.3	663.5	89
Zimbabwe	76.00	6.31	640	14.0	41.0	45.0	11.0	227.5	91
AMERICA									
Antigua & Barbuda	56.00	0.39	4,600	–	–	–	100.0	100.0	85
Argentina	59.00	76.49	2,370	13.0	35.0	52.0	334.8	1,495.0	90
Bahamas	70.50	2.85	11,400	10.0	11.0	79.0	6.1	128.4	90
Barbados	78.00	1.72	6,745	7.0	20.0	73.0	5.5	120.2	90
Belize	63.00	0.37	1,975	30.0	20.0	50.0	2.4	111.8	90
Bolivia	54.50	4.38	590	20.0	25.0	55.0	391.9	819.4	91
Brazil	63.60	402.79	2,680	15.0	34.0	51.0	227.8	14,412.0	91
Canada	75.00	578.60	22,040	5.0	27.0	68.0	4.6	131.4	91
Chile	63.00	26.08	2,010	12.0	37.0	51.0	20.5	173.0	90
Colombia	59.00	38.00	1,200	21.0	35.0	44.0	24.3	397.9	91
Costa Rica	59.60	5.10	1,750	20.0	25.0	55.0	24.8	281.9	91
Cuba	56.90	10.50	1,000	62.0	16.0	22.0	–	103.1	88
Dominica	61.70	0.16	1,940	–	–	–	–	119.2	90
Dominican Republic	53.00	5.85	820	17.0	30.0	53.0	18.0	425.9	90
Ecuador	56.00	10.15	940	19.0	34.0	47.0	34.4	978.0	91
El Salvador	60.00	5.35	1,040	16.0	22.0	62.0	16.8	287.8	90
Grenada	–	0.20	2,120	24.0	14.0	62.0	–	109.4	89
Guatemala	59.10	8.31	900	25.0	20.0	55.0	13.4	268.1	90
Guyana	60.40	0.29	370	26.0	32.0	42.0	20.0	194.4	88
Haiti	64.80	2.55	400	32.0	22.0	46.0	6.8	123.7	90
Honduras	50.00	4.42	900	22.0	23.0	55.0	4.7	151.4	90
Jamaica	71.60	3.60	1,510	7.0	33.0	60.0	18.5	185.3	90
Mexico	46.90	224.00	2,604	9.0	33.0	58.0	72.7	1,723.8	91
Nicaragua	61.90	1.68	434	23.0	25.0	52.0	86.6	35,585.0	89
Panama	59.20	4.29	1,790	10.0	17.0	73.0	2.5	103.0	91
Paraguay	51.00	4.80	1,110	27.0	26.0	47.0	2.2	427.1	91
Peru	56.30	25.15	1,160	12.0	31.0	57.0	160.3	34,274.0	91
St. Kitts & Nevis	69.50	0.13	3,330	10.0	20.0	70.0	–	115.5	91
St. Lucia	54.40	0.29	1,950	24.0	26.0	50.0	3.6	120.0	90

(continues)

Table 3 — Economic summary: labor and growth

	Econ. active population (%, 1986)	GNP (US$'000, 1990)	Per cap. GNP (US$, 1990)	GNP distribution (%) per economic sector, 1990 (primary)	(secondary)	(tertiary)	Inflation (avg. rate, (1980–89)	Consumer price changes (1985 = 100)	Year
St. Vincent & Gren.	53.90	0.19	1,610	30.0	20.0	50.0	–	104.1	87
Suriname	38.70	1.36	3,050	11.0	24.0	65.0	6.2	254.8	87
Trinidad & Tobago	61.30	4.46	3,470	4.0	43.0	53.0	5.8	159.0	90
United States	75.50	5,329.60	21,530	2.0	22.5	75.5	4.0	126.6	91
Uruguay	63.00	4.92	2,560	11.0	34.0	55.0	59.2	1,794.0	90
Venezuela	57.90	50.57	2,560	7.0	47.0	46.0	16.0	644.3	91
OCEANIA									
Australia	69.79	298.20	17,740	4.0	35.0	61.0	7.8	146.4	90
Fiji	56.00	1.30	1,730	25.0	23.0	52.0	5.6	147.7	91
Kiribati	75.60	0.05	760	–	–	–	–	126.9	90
Marshall Islands	–	0.10	2,500	–	–	–	–	–	–
Micronesia	–	0.22	2,000	–	–	–	–	–	–
Nauru	69.80	0.12	13,000	–	–	–	–	–	–
New Zealand	64.00	44.10	13,200	9.0	21.0	70.0	11.4	160.4	91
Papua New Guinea	54.00	3.44	900	25.0	40.0	35.0	5.6	128.4	90
Samoa	48.60	0.12	730	30.0	12.0	58.0	–	147.2	90
Solomon Islands	88.60	0.19	580	64.0	6.0	30.0	10.5	183.9	90
Tonga	44.70	0.10	1,100	40.0	12.0	48.0	7.5	176.81	91
Tuvalu	81.00	–	1,200	–	–	–	–	127.5	88
Vanuatu	85.00	0.25	1,640	25.0	–	75.0	4.3	149.2	90

Table 4 — Economic summary: money and finance

	Currency	Monetary unit per US$1 (exchange)	(date)	Money reserves (million US$) (amount)	(date)	Foreign debt (million US$, 1989)
EUROPE						
Albania	lek	110.00	February '93	–	–	–
Andorra	French franc	5.36	April '93	–	–	–
Austria	schilling	11.16	April '93	10,171.00	January '92	67,807
Belgium	franc	32.65	April '93	11,097.00	November '91	233,179
Bulgaria	lev	26.31	February '93	–	–	10,964
ex Czechoslovakia	crown	29.17	February '93	2,152.00	September '91	7,300
Denmark	crown	6.08	April '93	6,766.00	January '92	71,225
Finland	mark	5.55	April '93	7,608.70	December '91	12,257
France	franc	5.36	April '93	31,284.00	December '91	384,200
Germany	mark	1.59	April '93	–	–	–
Germany (*ex GFR*)	–	–	–	63,001.00	December '91	299,869
Great Britain (UK)	pound sterl.	0.64	April '93	40,860.00	February '92	110,560
Greece	drachma	216.64	April '93	4,345.00	January '92	11,143
Hungary	forint	84.89	February '93	3,295.00	November '91	16,843
Iceland	crown	66.11	February '93	449.50	December '91	1,742
Ireland	pound	0.65	April '93	5,242.00	January '92	40,943
Italy	lira	1,531.62	April '93	45,061.00	January '92	775,050
ex Yugoslavia	–	–	–	2,682.00	December '91	14,303
- Bosnia-Herzegovina	dinar	750.03	February '93	–	–	–

(continues)

Table 4 — Economic summary: money and finance

	Currency	Monetary unit per US$1 (exchange)	(date)	Money reserves (million US$) (amount)	(date)	Foreign debt (million US$, 19[illegible])
- Croatia	dinar	1,031.98	February '93	–	–	–
- Macedonia	dinar	750.03	February '93	–	–	–
- Slovenia	tolar	102.65	February '93	–	–	–
- Yugoslavia (Fed. Rep.)	new dinar	750.03	February '93	–	–	–
Liechtenstein	Swiss franc	1.45	April '93	–	–	–
Luxembourg	franc	32.65	April '93	28.78	January '92	348
Malta	lira	0.38	February '93	1,295.70	November '91	354
Monaco	French franc	5.36	April '93	–	–	–
Netherlands	guilder	1.78	April '93	16,790.00	January '91	153,396
Norway	crown	6.74	April '93	13,062.90	January '92	24,122
Poland	zloty	16,500.74	February '93	3,358.30	January '92	34,747
Portugal	escudo	147.27	April '93	20,629.00	December '91	14,644
Romania	leu	501.15	February '93	380.00	December '91	–
San Marino	Italian lira	1,531.62	April '93	–	–	–
Spain	peseta	114.30	April '93	64,018.00	January '92	198,000
Sweden	crown	7.39	April '93	18,331.00	December '91	94,668
Switzerland	franc	1.45	April '93	28,861.00	January '92	–
ex USSR	–	–	–	–	–	81,000
- Estonia	crown	13.82	February '93	–	–	0.62% (b)
- Georgia	ruble	0.59 (a)	February '93	–	–	1.62% (b)
- Latvia	ruble	0.59 (a)	February '93	–	–	1.14% (b)
- Lithuania	ruble	0.59 (a)	February '93	–	–	1.41% (b)
CIS						
- Armenia	ruble	0.59 (a)	February '93	–	–	0.86% (b)
- Azerbaijan	ruble	0.59 (a)	February '93	–	–	1.64% (b)
- Belarus	ruble	0.59 (a)	February '93	–	–	4.13% (b)
- Kazakhstan	ruble	0.59 (a)	February '93	–	–	3.86% (b)
- Kyrgyzstan	ruble	0.59 (a)	February '93	–	–	0.95% (b)
- Moldova	ruble	0.59 (a)	February '93	–	–	1.29% (b)
- Russia	ruble	0.59 (a)	February '93	–	–	61.34% (b)
- Tajikistan	ruble	0.59 (a)	February '93	–	–	0.82% (b)
- Turkmenistan	ruble	0.59 (a)	February '93	–	–	0.70% (b)
- Ukraine	ruble	0.59 (a)	February '93	–	–	16.37% (b)
- Uzbekistan	ruble	0.59 (a)	February '93	–	–	3.25% (b)
Vatican City	Italian lira	1,531.62	April '93	–	–	–
ASIA						
Afghanistan	afghani	68.95	February '93	252.99	September '91	1,800
Bahrain	dinar	0.38	February '93	1,425.70	January '92	365
Bangladesh	taka	39.25	February '93	1,282.20	December '91	9,926
Bhutan	ngultrum	29.51	February '93	–	–	77
Brunei	dollar	1.65	February '93	–	–	–
Cambodia	riel	2,001.38	February '93	–	–	704
China	renminbi	5.76	February '93	43,060.00	November '91	37,043
Cyprus	pound	0.49	February '93	1,394.00	November '91	–
Hong Kong	dollar	7.73	February '93	–	–	–
India	rupee	29.51	February '93	3,902.00	January '92	54,776
Indonesia	rupee	2,087.58	February '93	9,496.00	January '92	40,851
Iran	rial	66.30	February '93	–	–	5,000
Iraq	dinar	0.41	February '93	–	–	75,000

(continues)

Table 4 — Economic summary: money and finance

	Currency	Monetary unit per US$1 (exchange)	(date)	Money reserves (million US$) (amount)	(date)	Foreign debt (million US$, 1989)
Israel	shekel	2.81	February '93	6,279.10	December '91	74,216
Japan	yen	113.71	April '93	71,709.00	January '92	113,300
Jordan	dinar	0.69	February '93	813.10	January '92	6,404
Korea, North	won	2.15	February '93	–	–	6,780
Korea, South	won	801.59	February '93	9,618.00	November '91	17,351
Kuwait	dinar	0.31	February '93	3,409.00	December '91	508
Laos	new kip	720.09	February '93	–	–	939
Lebanon	pound	1,826.94	February '93	1,065.20	December '92	234
Malaysia	ringgit	2.63	February '93	10,222.00	November '91	14,461
Maldives	rufiyaa	129.53	February '93	26.50	January '92	54.50
Mongolia	tugrik	149.99	February '93	–	–	17,000
Myanmar (Burma)	kyat	6.58	February '93	232.40	June '91	4,045
Nepal	rupee	46.63	February '93	406.00	January '92	1,290
Oman	riyal	0.39	February '93	1,712.10	November '91	2,626
Pakistan	rupee	26.06	February '93	391.00	January '92	14,669
Philippines	peso	24.70	February '93	3,246.00	December '91	22,992
Qatar	riyal	3.70	February '93	627.70	August '91	1,100
Saudi Arabia	riyal	3.67	February '93	11,836.00	January '92	1,925
Singapore	dollar	1.65	February '93	32,884.00	November '91	3,102
Sri Lanka	rupee	46.19	February '93	672.00	January '92	4,238
Syria	pound	21.00	February '93	23,040.00	October '89	3,934
Taiwan	new dollar	26.03	February '93	–	–	3,765
Thailand	baht	25.56	February '93	18,061.00	January '92	12,424
Turkey	lire	9,070.58	February '93	5,144.00	December '91	34,781
United Arab Emirates	dirham	3.67	February '93	5,365.40	December '91	9,300
Vietnam	dong	10,480.20	February '93	–	–	9,000
Yemen	dinar	0.45	February '93	243.50	January '90	4,775
AFRICA						
Algeria	dinar	22.57	February '93	1,436.00	January '92	23,609
Angola	kwanza	526.57	February '93	–	–	1,356
Benin	CFA franc	268.00	April '93	107.20	October '91	1,046
Botswana	pula	2.31	February '93	3,063.32	November '91	509
Burkina Faso	CFA franc	268.00	April '93	295.30	October '91	685
Burundi	franc	248.85	February '93	157.58	January '92	810
Cameroon	CFA franc	268.00	April '93	34.94	June '91	3,708
Cape Verde	escudo	75.29	February '93	57.45	June '91	120
Central African Rep.	CFA franc	268.00	April '93	94.64	February '91	642
Chad	CFA franc	268.00	April '93	106.20	June '91	317
Comoros	Comorian franc	271.06	April '93	22.29	June '91	162
Congo	CFA franc	268.00	April '93	15.14	June '92	3,535
Djibouti	franc	174.38	February '93	99.60	January '92	133
Egypt	pound	3.35	February '93	4,813.00	November '91	39,751
Equatorial Guinea	CFA franc	268.00	April '93	1.18	August '91	204
Ethiopia	birr	4.95	February '93	54.50	December '91	2,876
Gabon	CFA franc	268.00	April '93	428.14	June '91	2,478
Gambia	dalasi	8.74	February '93	63.70	September '91	292
Ghana	cedi	550.02	February '93	444.90	September '91	2,279
Guinea	franc	812.50	February '93	–	–	1,967
Guinea-Bissau	peso	5,008.45	February '93	–	–	473

(continues)

Table 4 — Economic summary: money and finance

	Currency	Monetary unit per US$1 (exchange)	(date)	Money reserves (million US$) (amount)	(date)	Foreign debt (million US$, 1989)
Ivory Coast	CFA franc	268.00	April '93	8.50	October '91	8,156
Kenya	shilling	36.50	February '93	109.50	November '91	4,001
Lesotho	loti	3.12	February '93	137.00	January '92	312
Liberia	dollar	1.00	April '93	7.87	December '89	1,091
Libya	dinar	0.29	February '93	5,695.00	December '91	182
Madagascar	franc	1,850.92	February '93	113.20	September '90	3,345
Malawi	kwacha	4.41	February '93	167.00	November '91	1,242
Mali	CFA franc	384.25	January '92	247.90	October '91	2,055
Mauritania	ouguiya	106.01	February '93	51.30	November '91	1,777
Mauritius	rupee	17.37	February '93	869.10	January '92	631
Morocco	dirham	9.00	February '93	2,928.00	January '92	19,507
Mozambique	metical	2,740.41	February '93	–	–	3,885
Namibia	rand	3.12	February '93	–	–	1,880
Niger	CFA franc	268.00	April '93	189.60	October '91	1,127
Nigeria	naira	23.00	February '93	4,435.00	December '91	31,668
Rwanda	franc	154.81	February '93	96.13	January '92	606
São Tomé & Principe	dobra	6.46	February '93	–	–	125
Senegal	CFA franc	268.00	April '93	26.54	January '92	3,508
Seychelles	rupee	5.25	February '93	26.54	January '92	133
Sierra Leone	leone	535.04	February '93	9.60	January '91	512
Somalia	shilling	2,620.05	February '93	11.40	January '90	1,814
South Africa	rand	3.12	February '93	1,270.00	January '92	29,520
Sudan	pound	10.00	February '93	6.50	January '92	8,261
Swaziland	lilangeni	3.12	February '93	171.93	December '91	260
Tanzania	shilling	340.07	February '93	–	–	4,505
Togo	CFA franc	268.00	April '93	151.50	June '91	946
Tunisia	dinar	1.01	February '93	789.00	December '91	6,085
Uganda	shilling	1,211.77	February '93	57.20	January '92	1,489
Zaire	zaïre	15,510.70	February '93	169.74	October '91	7,571
Zambia	kwacha	375.05	February '93	184.60	December '91	4,095
Zimbabwe	dollar	6.32	February '93	105.00	January '92	2,568
AMERICA						
Antigua & Barbuda	dollar	2.90	April '92	30.37	September '91	237
Argentina	peso	1.00	February '93	1,629.60	January '92	51,429
Bahamas	dollar	1.00	February '93	171.80	November '91	704
Barbados	dollar	2.01	February '93	86.36	December '91	870
Belize	dollar	2.00	January '92	56.39	January '92	126
Bolivia	peso	4.12	February '93	106.40	January '92	3,065
Brazil	new cruzeiro	17,044.73	February '93	6,177.00	September '91	84,284
Canada	dollar	1.26	April '93	18,118.00	January '92	311,971
Chile	peso	385.84	February '93	6,133.90	September '91	10,850
Colombia	peso	821.98	February '93	5,988.00	November '91	14,001
Costa Rica	colón	138.45	February '93	934.48	January '92	3,480
Cuba	peso	0.76	February '93	–	–	6,700
Dominica	dollar	2.90	April '92	99.60	January '92	63.2
Dominican Republic	peso	13.00	February '93	448.00	January '92	3,281
Ecuador	sucre	1,842.13	February '93	708.50	October '91	9,421
El Salvador	colón	8.81	February '93	287.80	January '92	1,657
Grenada	dollar	2.90	April '92	16.78	January '91	67.8

(continues)

Table 4 — Economic summary: money and finance

	Currency	Monetary unit per US$1 (exchange)	(date)	Money reserves (million US$) (amount)	(date)	Foreign debt (million US$, 1989)
Guatemala	quetzal	5.32	February '93	807.30	December '91	2,089
Guyana	dollar	126.02	February '93	124.42	December '91	987
Haiti	gourde	12.00	February '93	5.30	June '91	684
Honduras	lempira	5.87	February '93	104.90	December '91	2,823
Jamaica	dollar	22.05	February '93	180.70	January '91	3,594
Mexico	new peso	3.10	February '93	17,295.00	October '91	76,257
Nicaragua	córdoba	6.01	February '93	–	–	7,546
Panama	balboa	1.00	February '93	498.00	November '91	3,575
Paraguay	guaraní	1,648.32	February '93	671.61	January '92	2,098
Peru	new sol	1.73	February '93	2,443.00	January '92	12,669
St. Kitts & Nevis	dollar	2.90	April '92	14.47	September '91	32.5
St. Lucia	dollar	2.70	January '92	49.40	September '91	55
St. Vincent & Grenad.	dollar	2.90	April '92	21.00	September '91	49.1
Suriname	guilder	1.78	February '93	12.00	October '91	70
Trinidad & Tobago	dollar	4.25	February '93	338.60	December '91	1,680
United States	dollar	1.00	–	6,481.00	January '92	359,800
Uruguay	new peso	3,559.50	February '93	369.00	November '91	2,967
Venezuela	bolívar	81.80	February '93	10,665.00	December '91	25,339
OCEANIA						
Australia	dollar	1.39	April '93	14,731.00	January '92	70,397
Fiji	dollar	1.59	February '93	271.43	December '91	286
Kiribati	dollar	–	April '93	–	–	12.0
Marshall Islands	dollar	1	April '93	–	–	–
Micronesia	dollar	1	April '93	–	–	–
Nauru	dollar	1.39	April '93	–	–	–
New Zealand	dollar	1.96	February '93	2,949.00	January '92	19,200
Papua New Guinea	kina	1.00	February '93	323.00	December '91	1,370
Samoa	tala	2.58	April '92	67.81	December '91	800
Solomon Islands	dollar	2.82	January '92	10.29	January '92	100
Tonga	pa'anga	1.39	April '93	–	–	47
Tuvalu	dollar	1.39	April '93	–	–	–
Vanuatu	vatu	112.19	January '92	39.66	December '91	26

(a) The former U.S.S.R. ruble is quoted at the official exchange rate. The "market" exchange rate on the same date was 570.67 rubles per US$.
(b) Percentage distribution of the foreign debt of the former U.S.S.R. as agreed upon by the various independent republics on December 4, 1991.

Table 5 — Economic summary: foreign trade and tourism

	Exports (million US$)	Imports (million US$)	Balance of payments (in million US$)	Year	Tourism (tourists/'000)	(year)
EUROPE						
Albania	267.4	446.5	–	90	14.4	89
Andorra	24.6	700.4	–	87	12,000.0	88
Austria	40,252.0	48,234.0	958.0	87	19,201.8	90

(continues)

Table 5 — Economic summary: foreign trade and tourism

	Exports (million US$)	Imports (million US$)	Balance of payments (in million US$)	Year	Tourism (tourists/'000)	(year)
Belgium	108,762.0	108,132.0	4,548.0	90	12,168.3	89
Bulgaria	17,300.9	16,713.6	–	–	8,295.0	89
ex Czechoslovakia	2,753.0	2,313.0	536.0	91	24,486.0	89
Denmark	35,740.0	31,174.0	1,541.0	90	8,638.1	89
Finland	26,089.0	25,322.0	–6,682.0	90	2,829.8	90
France	206,672.0	220,339.0	–13,777.0	90	38,228.0	89
Germany	–	–	–	–	16,000.0	90
Germany (*ex GFR*)	391,580.0	319,630.0	44,040.0	90	–	–
Great Britain (UK)	182,229.0	214,800.0	26,086.0	90	17,338.0	89
Greece	6,365.0	16,543.0	–3,537.0	90	8,274.0	89
Hungary	9,151.0	8,617.0	379.0	90	37,000.0	90
Iceland	1,588.6	1,509.1	–160.3	90	141.8	90
Ireland	23,359.0	19,382.0	1,433.0	90	3,484.0	89
Italy	169,940.0	169,220.0	–12,730.0	90	55,131.0	89
Lichtenstein	989.4	535.4	–	89	77.3	89
Luxembourg	5,402.0	6,193.1	–	89	559.4	89
Malta	858.0	1,494.0	6.0	89	783.8	89
Monaco	–	–	–	–	245.1	89
Netherlands	122,253.0	111,737.0	10,313.0	90	3,321.9	89
Norway	34,138.0	26,513.0	3,783.0	90	5,340.0	89
Poland	15,837.0	12,248.0	3,067.0	90	8,233.0	89
Portugal	16,427.0	23,007.0	–139.0	90	18,422.0	89
Romania	883.0	1,049.0	–92.0	91	6,500.0	90
San Marino	–	–	–	–	2,917.0	89
Spain	55,221.0	86,959.0	15,983.0	91	54,178.2	89
Sweden	56,835.0	53,433.0	–5,463.0	90	3,363.0	89
Switzerland	77,488.0	83,865.0	6,941.0	90	29,860.0	89
ex USSR	109,200.3	114,594.1	–	89	6,007.0	89
- Estonia	3.12 (b)	3.82 (b)	–	–	–	–
- Georgia	6.09 (b)	6.47 (b)	–	–	–	–
- Latvia	5.41 (b)	6.03 (b)	–	–	–	–
- Lithuania	6.33 (b)	7.35 (b)	–	–	–	–
CIS						
- Armenia	3.69 (b)	4.90 (b)	–	–	–	–
- Azerbaijan	7.12 (b)	5.19 (b)	–	–	–	–
- Belarus	20.30 (a)	19.35 (a)	–	–	–	–
- Kazakhstan	9.09 (b)	17.57 (b)	–	–	–	–
- Kyrgyzstan	2.60 (b)	4.29 (b)	–	–	–	–
- Moldova	5.46 (a)	6.61 (a)	–	–	–	–
- Russia	109.61 (a)	144.27 (a)	–	–	–	–
- Tajikistan	2.53 (b)	3.93 (b)	–	–	–	–
- Turkmenistan	2.66 (b)	3.33 (b)	–	–	–	–
- Ukraine	48.06 (a)	54.54 (a)	–	–	–	–
- Uzbekistan	10.17 (b)	14.16 (b)	–	–	–	–
ex Yugoslavia	–	–	–2,364.0	90	8,644.0	89
- Bosnia-Herzegovina	1,796.0	1,630.0	–	90	–	–
- Croatia	2,549.0	3,837.0	–	90	–	–
- Macedonia	506.0	972.0	–	90	–	–
- Slovenia	3,602.0	4,091.0	–	90	–	–
- Yugoslavia (Fed. Rep.)	3,964.0	5,630.0	–	90	–	–

(continues)

Table 5 — Economic summary: foreign trade and tourism

	Exports (million US$)	Imports (million US$)	Balance of payments (in million US$)	Year	Tourism (tourists/'000)	(yea
Bahama	300.9	1,228.8	–185.2	90	3,398.3	89
Barbados	146.9	599.3	–2.6	89	461.3	89
Belize	124.4	188.5	–19.1	89	144.2	89
Bolivia	830.8	775.6	–200.8	90	163.2	89
Brazil	34,375.0	18,263.0	1,025.0	89	1,742.9	89
Canada	129,046.0	119,093.0	–18,815.0	90	38,000.0	89
Chile	8,310.0	7,037.0	–790.0	90	797.4	89
Colombia	7,105.0	5,088.0	391.0	90	733.0	89
Costa Rica	1,365.6	1,833.3	–583.8	90	376.0	89
Cuba	6,297.6	9,172.9	–	–	225.0	89
Dominica	59.9	103.9	–25.8	90	27.3	89
Dominican Republic	734.7	1,792.9	–58.6	90	1,221.7	89
Ecuador	2,714.0	1,711.0	–136.0	90	238.0	89
El Salvador	557.5	1,220.2	–369.7	89	131.0	89
Grenada	31.6	88.7	–26.0	87	196.1	89
Guatemala	1,126.1	1,484.4	–367.1	89	437.0	89
Guyana	214.0	208.1	–96.0	85	–	–
Haiti	139.0	224.8	–55.2	90	79.3	89
Honduras	966.7	964.0	–302.2	89	249.8	89
Jamaica	1,156.9	1,624.8	–263.4	90	1,016.6	89
Mexico	26,773.0	29,799.0	–5,255.0	90	6,351.0	89
Nicaragua	235.7	718.3	–715.2	88	100.0	89
Panama	3,195.0	3,804.0	168.0	90	2,112.0	89
Paraguay	1,392.3	1,353.6	91.2	90	284.0	89
Peru	3,276.0	2,885.0	–674.0	90	320.0	89
St. Kitts & Nevis	24.6	103.2	–50.3	90	108.7	89
St. Lucia	111.9	235.2	–41.6	89	242.4	89
St. Vincent & Grenad.	74.6	114.8	–10.2	89	128.6	89
Suriname	465.9	374.4	33.0	90	10 3	89
Trinidad & Tobago	1,935.2	947.6	430.0	90	186.3	89
United States	389,540.0	497,660.0	–92.2	90	36,604.0	89
Uruguay	1,692.9	1,266.9	223.9	90	843.5	89
Venezuela	17,411.0	6,543.0	8,198.0	87	692.4	89
OCEANIA						
Australia	38,930.0	38,966.0	–15,047.0	90	2,249.3	89
Fiji	494.3	591.1	6.9	90	273.7	89
Kiribati	2.9	26.9	6.0	90	8.0	89
Marshall Islands	2.1	33.8	–	88	–	–
Micronesia	–	–	–	–	–	–
Nauru	73.5	13.9	–	88	–	–
New Zealand	9,283.0	8,452.0	–1,594.0	90	933.4	89
Papua New Guinea	1,318.5	1,341.3	–355.3	89	48.9	89
Samoa	8.9	73.2	0.8	86	49.7	89
Solomon Islands	70.4	80.4	–25.5	90	12.9	89
Tonga	8.9	47.0	8.3	90	31.6	89
Tuvalu	–	2.6	–	86	1.0	89
Vanuatu	13.8	79.6	8.0	90	35.0	89

(a) Imports in billions of rubles, 1991 (including transactions inside the former U.S.S.R.).
(b) Imports in billions of rubles, 1989 (including transactions inside the former U.S.S.R.).

Table 6 — Transportation and communications

	Road network (mi)	(yr)	Rail network (mi)	(yr)	Ships (1990 total)	Airports (No.)	Books (titles publ.)	(yr)	Dailies (1988 circ./'000)	Periodicals (circ./'000)	(yr)
EUROPE											
Albania	10,354	88	446	90	19	1	939	85	135	–	–
Andorra	136	81	–	–	–	–	14	86	85	–	–
Austria	67,878	89	3,487	90	32	6	9,462	89	2,712	–	–
Belgium	79,535	87	2,178	89	330	5	6,822	89	2,174	36	88
Bulgaria	22,876	89	2,666	89	200	5	4,543	89	2,396	4,008	89
ex Czechoslovakia	45,657	89	8,126	89	23	8	9,294	89	5,364	1,139	88
Denmark	43,880	90	1,453	89	1,260	9	10,762	89	1,842	1,493	88
Finland	47,607	90	3,638	90	269	6	10,097	89	2,707	–	–
France	499,032	90	21,280	89	900	14	40,115	89	9,328	16,282	81
Germany	137,060	90	27,201	89	1,551	13	–	–	–	–	–
Germany (*ex GFR*)	–	–	–	–	–	–	71,998	89	29,953	13,710	88
Great Britain (UK)	235,753	89	10,490	89	1,998	11	52,861	85	22,494	29,047	88
Greece	23,626	87	1,537	89	1,814	4	4,651	85	609	–	–
Hungary	18,496	90	4,856	89	–	1	8,631	89	2,888	5,845	86
Iceland	7,064	89	–	–	392	1	1,250	89	125	–	–
Ireland	57,228	89	1,205	88	177	3	2,679	85	724	1,935	88
Italy	188,066	89	12,127	89	1,616	5	22,647	89	6,005	2,027	88
Liechtenstein	200	86	12	90	–	–	–	–	16	2	88
Luxembourg	3,156	90	168	90	–	1	520	89	145	–	–
Malta	988	90	–	–	524	1	386	89	54	–	–
Monaco	31	86	1	90		1	48	89	–	708	84
Netherlands	71,489	88	1,753	89	1,227	5	15,392	89	4,592	800	84
Norway	55,056	91	2,543	90	2,557	18	5,331	89	2,309	375	88
Poland	210,918	88	16,261	90	698	4	10,286	89	6,939	3,106	88
Portugal	21,056	81	2,236	89	329	3	7,733	87	859	6,942	86
Romania	45,146	90	7,036	90	483	7	3,867	89	3,648	756	86
San Marino	147	87	–	–	–	–	–	–	–	–	–
Spain	96,990	88	7,790	89	2,338	2	38,353	89	3,200	–	–
Sweden	60,672	91	6,945	90	679	10	11,197	89	4,387	452	88
Switzerland	44,081	89	3,112	89	20	5	13,270	89	3,280	7,303	88
ex USSR	982,328	88	91,450	90	7,383	10	–	–	–	–	–
– Estonia	18,042	89	639	–	–	1	1,628	90	–	–	–
– Georgia	–	–	–	–	–	–	1,659	90	–	–	–
– Latvia	36,146	89	1,486	89	–	1	1,564	89	–	–	–
– Lithuania	26,350	90	1,234	90	–	1	2,686	89	–	–	–
CIS											
– Armenia	–	–	–	–	–	–	817	90	–	–	–
– Azerbaijan	–	–	–	–	–	–	829	90	–	–	–
– Belarus	–	–	–	–	–	–	2,962	88	2,738	2,413	89
– Kazakhstan	–	–	–	–	–	–	2,055	90	–	–	–
– Kyrgyzstan	–	–	–	–	–	–	936	90	–	–	–
– Moldova	–	–	–	–	–	–	1,277	89	–	–	–
– Russia	–	–	–	–	–	–	76,711	89	133,979	92,710	89
– Tajikistan	–	–	–	–	–	–	787	90	–	–	–
– Turkmenistan	–	–	–	–	–	–	759	90	24,000	–	–
– Ukraine	–	–	–	–	–	–	8,311	88	–	–	–
– Uzbekistan	–	–	–	–	–	–	2,080	90	–	–	–
Vatican City	–	–	–	–	–	–	168	88	70	–	–
ex Yugoslavia	–	–	–	–	–	–	–	–	2,354	23,505	89

(continues)

Table 6 — Transportation and communications

	Road network (mi)	(yr)	Rail network (mi)	(yr)	Ships (1990 total)	Airports (No.)	Books (titles publ.)	(yr)	Dailies (1988 circ./'000)	Periodicals (circ./'000)	(yr)
– Bosnia-Herzegovina	5,035	89	–	–	–	2	1,008	89	–	–	–
– Croatia	19,884	89	–	–	–	3	2,413	89	–	–	–
– Macedonia	6,566	90	–	–	–	1	796	89	–	–	–
– Slovenia	9,023	90	–	–	–	2	1,932	89	–	–	–
– Yugoslavia (Fed. Rep.)	76,364	89	5,932	89	501	1	5,190	89	–	–	–
ASIA											
Afghanistan	11,786	82	–	–	–	2	415	83	151	–	–
Bahrain	1,410	86	–	–	–	1	46	83	12	–	–
Bangladesh	6,750	86	1,781	88	308	2	1,209	88	1,016	350	86
Brunei	1,363	89	–	–	–	1	16	89	–	83	89
Cambodia	8,278	86	435	89	–	6	–	–	–	–	–
China	619,752	89	39,758	87	1,948	5	74,973	89	39,597	46,089	82
Cyprus	8,546	86	–	–	1,270	1	561	89	86	124	88
Hong Kong	948	91	21	89	375	1	5,681	83	3,146	–	–
India	1,099,136	85	38,425	88	855	5	11,851	89	21,857	42,464	86
Indonesia	145,117	87	4,052	86	1,884	6	1,687	89	3,716	3,445	88
Iran	93,923	86	2,832	85	393	2	6,289		640	–	–
Iraq	24,561	87	1,633	88	143	2	82		572	–	–
Israel	8,048	88	574	88	58	3	2,214	85	1,133	–	–
Japan	685,456	89	15,985	87	10,000	4	36,346	87	71,228	–	–
Jordan	4,340	85	384	86	–	2	–		210	902	88
Korea, North	13,640	82	5,270	89	89	3	–		1,000	–	–
Korea, South	35,018	89	3,991	89	2,110	3	39,267	89	10,429	–	–
Kuwait	2,540	87	–	–	225	1	793	88	410	420	88
Laos	8,113	86	–	–	–	1	–	–	13	–	–
Lebanon	4,569	89	257	82	175	1	–	–	276	–	–
Malaysia	24,223	86	1,319	86	498	3	3,348	89	2,462	4,292	84
Maldives	–	–	–	–	–	–	–	–	2	7	86
Mongolia	17,991	86	1,084	85	–	1	889	86	177	718	84
Myanmar (Burma)	14,384	86	1,945	87	142	1	673	85	329	–	–
Nepal	3,910	87	39	81	–	1	122	89	122	–	–
Pakistan	69,525	89	5,440	87	71	5	1,600	83	7,314	4,138	88
Philippines	100,642	86	657	88	1,420	2	1,072	88	3,298	–	–
Qatar	670	86	–	–	–	2	461	87	70	8	88
Saudi Arabia	56,637	87	637	87	311	4	207	83	490	–	–
Singapore	1,758	89	–	–	774	1	1,927	83	763	425	84
Sri Lanka	53,455	86	901	86	78	1	2,188	89	580	1,041	86
Syria	18,729	87	1,272	87	–	6	119	83	244	–	–
Taiwan	12,399	89	2,852	89	660	3	9,256	86	–	–	–
Thailand	27,534	89	2,311	89	296	24	11,217	89	4,750	7,275	88
Turkey	198,779	88	5,227	89	869	7	6,685	85	3,094	–	–
United Arab Emirates	2,703	84	–	–	–	4	152	89	300	–	–
Vietnam	53,134	86	1,825	86	190	8	2,060	83	545	–	–
Yemen	29,431	86	–	–	39	4	–	–	132	–	–
AFRICA											
Algeria	44,696	85	2,381	87	148	6	718	84	510	800	87
Angola	44,888	86	1,830	87	–	4	14	86	85	–	–
Benin	4,616	85	359	85	–	1	13	83	31	–	–

(continues)

Table 6 — Transportation and communications

	Road network (mi)	(yr)	Rail network (mi)	(yr)	Ships (1990 total)	Airports (No.)	Books (titles publ.)	(yr)	Dailies (1988 circ./'000)	Periodicals (circ./'000)	(yr)
Botswana	4,976	85	444	84	–	4	289	87	31*	–	–
Burkina Faso	6,963	83	341	88	–	2	4	85	5	30	86
Burundi	3,658	88	–	–	–	1	54	86	20	–	–
Cameroon	39,720	86	849	85	43	5	22	83	65	315	88
Cape Verde	1,395	84	–	–	–	1	10	–	–	–	–
Central African Rep.	11,981	88	–	–	–	1	–	–	–	–	–
Chad	20,026	88	–	–	–	2	–	–	1	1	88
Comoros	465	85	–	–	–	–	–	–	–	–	–
Congo	5,394	85	495	85	–	2	9	83	8	15	86
Djibouti	1,801	88	66	85	–	1	–	–	–	–	–
Egypt	19,617	86	3,320	86	435	5	1,451	88	1,953	2,031	88
Equatorial Guinea	1,711	82	–	–	–	2	–	–	1	–	–
Ethiopia	24,172	87	489	87	29	2	560	88	42	40	88
Gabon	4,672	86	640	83	–	6	–	–	15	20	88
Gambia	1,911	83	–	–	–	1	42	88	1	–	–
Ghana	17,546	85	591	85	146	3	350	83	460	–	–
Guinea	18,047	86	590	83	–	4	–	–	13	–	–
Guinea-Bissau	3,136	82	–	–	–	1	–	–	6	–	–
Ivory Coast	33,316	84	730	86	51	2	46	83	90	145	82
Kenya	33,581	85	1,201	85	–	4	933	87	303	281	82
Lesotho	2,923	88	1	83	–	1	–	–	47	10	82
Liberia	6,389	84	304	85	1,688	1	–	–	23	–	–
Libya	15,918	86	–	–	112	4	121	88	40	–	–
Madagascar	5,276	88	653	88	82	5	146	89	69	220	88
Malawi	7,573	85	514	86	–	3	141	89	25	121	86
Mali	8,705	89	401	87	–	2	160	84	40	–	–
Mauritania	5,053	88	428	88	–	3	21	85	–	–	–
Mauritius	1,105	86	–	–	36	1	100	89	75	45	88
Morocco	36,686	87	1,174	87	450	15	–	–	290	–	–
Mozambique	24,287	85	2,383	85	–	4	66	84	81	–	–
Namibia	25,863	87	1,477	85	–	1	–	–	18	–	–
Niger	6,197	86	–	–	–	2	1,466	89	1,108	–	–
Nigeria	76,880	85	2,173	87	249	3	–	–	–	–	–
Rwanda	7,483	87	–	–	–	2	207	87	1	171	88
São Tomé & Principe	236	88	–	–	–	–	–	–	–	–	–
Senegal	8,660	82	735	84	–	4	42	83	58	60	88
Seychelles	167	88	–	–	–	1	2	83	3	3	84
Sierra Leone	4,650	89	370	85	–	1	16	84	10	–	–
Somalia	13,814	88	–	–	27	1	–	–	–	–	–
South Africa	113,440	87	14,644	89	236	5	–	–	1,617	–	–
Sudan	45,618	85	3,412	83	21	3	–	–	590	121	88
Swaziland	1,723	88	229	87	–	1	–	–	50	–	–
Tanzania	37,038	84	2,765	85	39	5	363	84	180	–	–
Togo	4,995	86	326	85	–	2	–	–	10	–	–
Tunisia	17,180	88	1,390	88	73	5	293	88	172	–	–
Uganda	17,566	85	797	86	–	1	–	–	49	–	–
Zaire	28,371	80	3,186	88	–	5	194	83	45	115	84
Zambia	23,153	88	1,342	88	–	3	454	83	89	133	86
Zimbabwe	28,491	85	2,104	83	–	2	337	89	214	428	88

Table 6 — Transportation and communications

	Road network (mi)	(yr)	Rail network (mi)	(yr)	Ships (1990 total)	Airports (No.)	Books (titles publ.)	(yr)	Dailies (1988 circ./'000)	Periodicals (circ./'000)	(yr)
AMERICA											
Antigua & Barbuda	720	86	48	90	–	1	–	–	6	–	–
Argentina	131,049	86	21,199	88	479	6	4,836	87	2,652	–	–
Bahamas	2,542	85	–	–	807	2	–	–	35	–	–
Barbados	1,018	85	–	–	–	1	87	83	–	35	88
Belize	1,861	85	–	–	–	1	12	85	–	25	88
Bolivia	25,818	88	2,295	88	–	3	447	88	353	–	–
Brazil	931,608	88	18,496	87	691	6	17,648	85	7,944	4,766	85
Canada	548,234	84	74,400	86	1,224	7	8,600	83	5,993	16,719	88
Chile	49,118	87	5,075	90	365	2	2,350	89	840	118	87
Colombia	65,855	86	2,110	87	103	5	1,486	89	1,631	–	–
Costa Rica	22,045	90	434	87	30	2	198	89	245	818	82
Cuba	21,080	84	7,756	88	410	1	2,199	89	1,315	216	88
Dominica	469	84	–	–	–	1	–	–	–	–	–
Dominican Republic	10,614	85	1,025	87	31	3	1,504	83	267	–	–
Ecuador	22,692	88	695	86	158	2	–	–	887	–	–
El Salvador	7,542	87	373	86	–	2	15	88	229	–	–
Grenada	576	84	–		–	1	2	83	–	–	–
Guatemala	11,160	85	591	88	–	2	312	83	135	–	–
Guyana	5,512	85	68	85	75	1	46	89	58	–	–
Haiti	2,294	85	155	85	–	1	271	89	45	–	–
Honduras	11,467	88	592	89	754	3	–	–	199	–	–
Jamaica	10,316	84	215	85	–	2	71	85	155		–
Mexico	144,901	88	16,330	88	640	5	3,490	89	10,539	889	88
Nicaragua	9,298	86	213	86	–	1	41	87	80	–	–
Panama	5,984	88	353	87	4,748	1	114	83	161	–	–
Paraguay	14,636	86	273	87	39	1	–	–	53	–	–
Peru	43,364	87	2,140	86	617	1	481	88	669	–	–
St. Kitts & Nevis	189	87	–	–	–	1	3	88	–	22	86
St. Lucia	463	86	–	–	–	2	63	85	8	5	84
St. Vincent & Grenad.	462	87	–	–	–	1	–	–	–	11	88
Suriname	5,529	85	54	87	–	1	–	–	40	–	–
Trinidad & Tobago	4,898	85	–	–	49	1	101	83	134	302	88
United States	3,874,020	88	173,092	88	6,348	20	51,058	83	62,502	–	–
Uruguay	30,884	85	1,854	87	91	1	805	89	694	–	–
Venezuela	62,354	85	272	87	273	8	1202	87	2,225	468	82
OCEANIA											
Australia	528,851	86	23,574	88	721	6	10,963	87	4,121	15,208	84
Fiji	2,989	90	658	86	–	1	13	85	76	74	82
Kiribati	397	87	–	–	–	1	–	–	255	–	–
Marshall Islands	–	–	–	–	–	1	–	–	–	–	–
Micronesia	–	–	–	–	–	–	–	–	–	–	–
Nauru	12	87	4	90	–	1	–	–	–	–	–
New Zealand	57,644	89	2,645	89	135	3	3,452	84	1,090	–	–
Papua New Guinea	12,236	86	–	–	–	1	–	–	45	–	–
Samoa	1,293	83	–	–	–	1	–	–	–	–	–
Solomon Islands	1,302	87	–	–	–	1	–	–	–	–	–
Tonga	268	88	–	–	–	1	33	83	7	8	82
Tuvalu	5	85	–	–	–	1	–	–	–	–	–
Vanuatu	658	84	–	–	–	1	–	–	–	2	88

Table 7 — Economic production: Crops and livestock
Cereals

WHEAT (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	601,723	550,993	100.0	**Egypt**	4,268	4,483	0.8
China	98,232	95,003	17.2	**Mexico**	3,931	4,115	0.7
ex USSR	109,600	80,000	14.5	**Saudi Arabia**	3,600	4,000	0.7
India	49,850	54,522	9.9	**Denmark**	3,953	3,629	0.7
United States	74,475	53,915	9.8	**Brazil**	3,094	3,077	0.6
France	33,312	34,483	6.3	**Greece**	1,965	2,750	0.5
Canada	32,709	32,822	6.0	**South Africa**	1,702	2,245	0.4
Turkey	20,000	20,400	3.7	**Syria**	2,070	2,135	0.4
Germany	15,242	16,669	3.0	**Tunisia**	1,122	1,786	0.3
Pakistan	14,316	14,505	2.6	**Algeria**	1,005	1,74[illegible]	0.3
Great Britain (UK)	14,000	14,300	2.6	**Afghanistan**	1,650	1,726	0.3
Australia	15,402	9,633	1.7	**Belgium–Luxembourg**	1,409	1,620	0.3
Italy	8,109	9,289	1.7	**Chile**	1,718	1,589	0.3
Poland	9,026	9,269	1.7	**Sweden**	2,243	1,524	0.3
Argentina	11,014	9,000	1.6	**Austria**	1,404	1,341	0.2
Iran	8,218	8,900	1.6	**Bangladesh**	890	1,004	0.2
ex Yugoslavia	6,359	6,530	1.2	**Netherlands**	1,076	916	0.2
ex Czechoslovakia	6,707	6,205	1.1	**Ethiopia**	867	890	0.2
Hungary	6,198	5,954	1.1	**Japan**	952	860	0.2
Romania	7,290	5,442	1.0	**Nepal**	855	836	0.2
Spain	4,760	5,392	1.0	**Ireland**	625	703	0.1
Morocco	3,614	4,939	0.9	**Switzerland**	563	574	0.1
Bulgaria	5,292	4,503	0.8	**Mongolia**	467	536	0.1

RICE (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	521,703	519,869	100.0	**Nigeria**	2,500	3,185	0.6
China	191,197	187,450	36.1	**Egypt**	3,167	3,152	0.6
India	111,953	110,945	21.3	**Cambodia**	2,500	2,400	0.5
Indonesia	45,179	44,321	8.5	**Sri Lanka**	2,538	2,397	0.5
Bangladesh	26,778	28,575	5.5	***ex USSR***	2,473	2,200	0.4
Thailand	17,300	20,040	3.9	**Madagascar**	2,420	2,200	0.4
Vietnam	19,225	19,428	3.7	**Iran**	2,273	2,100	0.4
Myanmar (Burma)	13,969	13,201	2.5	**Colombia**	2,117	1,739	0.3
Japan	13,124	12,005	2.3	**Malaysia**	1,655	1,550	0.3
Philippines	9,319	9,670	1.9	**Italy**	1,291	1,236	0.2
Brazil	7,419	9,503	1.8	**Ecuador**	840	841	0.2
Korea, South	7,732	7,478	1.4	**Peru**	966	814	0.2
United States	7,080	7,006	1.3	**Australia**	924	726	0.1
Korea, North	5,300	5,100	1.0	**Ivory Coast**	687	690	0.1
Pakistan	4,897	4,903	0.9	**Tanzania**	740	664	0.1
Nepal	3,502	3,600	0.7	**Spain**	569	582	0.1

CORN (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	479,340	478,775	100.0	**Brazil**	21,339	22,604	4.7
United States	201,508	189,867	39.7	**Mexico**	14,635	13,527	2.8
China	97,158	93,350	19.5				

(continues)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 19
France	9,291	12,787	2.7	Philippines	4,854	4,655	1.0
Romania	6,810	10,493	2.2	Korea, North	4,400	4,500	0.9
ex Yugoslavia	6,724	8,800	1.8	Thailand	3,722	3,990	0.8
ex USSR	9,900	8,500	1.8	Spain	3,086	3,151	0.7
South Africa	8,900	8,200	1.7	Bulgaria	1,221	2,718	0.6
India	9,073	8,200	1.7	Tanzania	2,445	2,332	0.5
Argentina	5,049	7,768	1.6	Kenya	2,630	2,250	0.5
Hungary	4,500	7,509	1.6	Turkey	2,100	2,100	0.4
Canada	7,157	7,319	1.5	Germany	1,552	1,928	0.4
Indonesia	6,734	6,409	1.3	Nigeria	1,832	1,900	0.4
Italy	5,864	6,208	1.3	Greece	1,992	1,700	0.4
Egypt	4,799	5,270	1.1	Malawi	1,343	1,590	0.3

BARLEY (in thousands of metric to

	1990 Prod.	1991 Prod.	% 1991		0 Prod.	1991 Prod.	% 19
World Total	181,946	169,385	100.0	China	3,000	3,000	1.8
ex USSR	56,600	42,000	24.8	Romania	2,680	2,951	1.7
Germany	13,992	14,449	8.5	Sweden	2,123	1,869	1.1
Canada	13,925	12,463	7.4	Italy	1,703	1,774	1.0
France	10,020	10,651	6.3	Algeria	833	1,751	1.0
United States	9,192	10,113	6.0	Finland	1,720	1,749	1.0
Spain	9,415	9,141	5.4	India	1,486	1,642	1.0
Turkey	7,300	7,800	4.6	Hungary	1,369	1,552	0.9
Great Britain (UK)	7,900	7,700	4.5	Bulgaria	1,387	1,495	0.9
Denmark	4,987	4,978	2.9	Austria	1,521	1,360	0.8
Poland	4,217	4,257	2.5	Ireland	1,380	1,281	0.8
Australia	4,055	4,025	2.4	Ethiopia	899	965	0.6
ex Czechoslovakia	4,071	3,793	2.2	Syria	846	950	0.6
Iran	3,360	3,600	2.1	*ex Yugoslavia*	692	742	0.4
Morocco	2,138	3,252	1.9	Tunisia	477	721	0.4

OATS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 19
World Total	42,799	34,186	100.0	France	848	733	2.1
ex USSR	18,800	14,000	41.0	China	600	600	1.8
United States	5,189	3,520	10.3	Norway	601	530	1.6
Canada	2,851	1,894	5.5	Great Britain (UK)	530	527	1.5
Germany	2,105	1,891	5.5	Argentina	434	450	1.3
Poland	2,119	1,873	5.5	Spain	524	410	1.2
Australia	1,568	1,615	4.7	Italy	298	358	1.0
Sweden	1,584	1,412	4.1	*ex Czechoslovakia*	421	346	1.0
Finland	1,662	1,155	3.4	Brazil	174	303	0.9

Cash Crops

SUGAR (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	110,823	112,224	100.0	China	7,197	7,836	7.0
India	11,168	12,528	11.2	Cuba	8,445	7,623	6.8
ex USSR	9,130	8,750	7.8	United States	6,273	6,531	5.8
Brazil	7,835	8,675	7.7				

(continues)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
France	4,743	4,676	4.2	Iran	625	760	0.7
Germany	4,671	4,245	3.8	Hungary	595	736	0.7
Thailand	3,506	4,006	3.6	*ex Czechoslovakia*	686	714	0.6
Mexico	3,278	3,943	3.5	Morocco	638	675	0.6
Australia	3,536	2,800	2.5	*ex Yugoslavia*	934	663	0.6
Indonesia	2,218	2,334	2.1	Dominican Republic	590	656	0.6
South Africa	2,289	2,152	1.9	Mauritius	624	580	0.5
Pakistan	2,017	2,086	1.9	Venezuela	499	556	0.5
Turkey	1,946	1,957	1.7	Peru	601	550	0.5
Philippines	1,810	1,780	1.6	Kenya	467	532	0.5
Italy	1,584	1,640	1.5	Denmark	572	500	0.4
Colombia	1,589	1,617	1.4	Swaziland	527	500	0.4
Argentina	1,351	1,594	1.4	Sudan	421	470	0.4
Poland	2,142	1,587	1.4	Austria	451	462	0.4
Great Britain (UK)	1,349	1,292	1.2	Fiji	408	389	0.3
Netherlands	1,337	1,060	0.9	Vietnam	376	380	0.3
Egypt	971	1,046	0.9	Chile	373	359	0.3
Spain	1,043	1,037	0.9	Bolivia	271	355	0.3
Guatemala	839	918	0.8	Zimbabwe	464	329	0.3
Japan	925	915	0.8	Ecuador	311	319	0.3
Belgium–Luxembourg	1,120	905	0.8	Romania	405	310	0.3

TEA (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		Prod.	1991 Prod.	% 19
World Total	2,533	2,576	100.0	Iran	44	45	1.7
India	715	730	28.3	Malawi	39	41	1.6
China	562	566	22.0	Bangladesh	39	38	1.5
Sri Lanka	238	241	9.4	Vietnam	31	32	1.2
Kenya	197	204	7.9	Tanzania	20	21	0.8
Indonesia	149	158	6.1	Zimbabwe	17	16	0.6
Turkey	123	136	5.3	South Africa	13	14	0.5
ex USSR	136	118	4.6	Rwanda	13	13	0.5
Japan	90	90	3.5	Brazil	10	10	0.4
Argentina	43	48	1.9	Uganda	7	8	0.3

COFFEE (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	6,282	6,088	100.0	Honduras	118	122	2.0
Brazil	1,463	1,497	24.6	Ecuador	135	114	1.9
Colombia	845	870	14.3	Philippines	134	113	1.9
Indonesia	411	408	6.7	Zaire	120	102	1.7
Mexico	440	299	4.9	Kenya	105	90	1.5
Vietnam	260	285	4.7	Peru	81	82	1.3
Ivory Coast	284	240	3.9	Madagascar	80	80	1.3
Guatemala	202	195	3.2	Venezuela	76	66	1.1
Uganda	129	180	3.0	Papua New Guinea	67	62	1.0
India	118	173	2.8	Cameroon	102	58	1.0
Ethiopia	206	168	2.8	Tanzania	52	56	0.9
Costa Rica	151	158	2.6	Thailand	61	55	0.9
El Salvador	136	149	2.4				

(continued)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
Dominican Republic	59	46	0.8	**Haiti**	37	37	0.6
Rwanda	45	43	0.7	**China**	33	35	0.6
Burundi	34	38	0.6	**Bolivia**	29	30	0.5

COCOA (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	2,528	2,455	100.0	**Cameroon**	99	95	3.9
Ivory Coast	750	710	28.9	**Colombia**	56	59	2.4
Brazil	355	345	14.1	**Dominican Republic**	59	50	2.0
Ghana	295	295	12.0	**Mexico**	46	39	1.6
Malaysia	235	225	9.2	**Papua New Guinea**	40	33	1.3
Indonesia	154	214	8.7	**Sierra Leone**	24	24	1.0
Ecuador	147	136	5.5	**Venezuela**	16	15	0.6
Nigeria	150	115	4.7	**Peru**	11	11	0.4

TOBACCO (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	7,076	7,662	100.0	**Korea, South**	70	73	1.0
China	2,617	3,121	40.7	**Japan**	78	71	0.9
United States	738	753	9 8	**Thailand**	71	71	0 9
India	550	560	7.3	**Canada**	63	68	0.9
Brazil	444	414	5 4	**Korea, North**	65	66	0.9
Turkey	288	247	3.2	**Poland**	59	57	0.7
ex USSR	260	240	3.1	***ex Yugoslavia***	46	46	0.6
Italy	194	192	2.5	**Cuba**	44	44	0.6
Zimbabwe	140	178	2.3	**Spain**	36	43	0.6
Greece	130	178	2.3	**Myanmar (Burma)**	40	40	0.5
Indonesia	150	159	2.1	**Colombia**	33	40	0.5
Malawi	101	125	1.6	**Bangladesh**	38	36	0.5
Argentina	68	94	1 2	**South Africa**	34	35	0.5
Philippines	82	79	1.0	**Romania**	32	34	0.4
Pakistan	68	76	1.0	**Vietnam**	18	28	0.4
Bulgaria	77	74	1.0	**France**	28	27	0.4

WINE (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	29,010	27,767	100.0	**Greece**	353	450	1.6
France	6,553	6,200	22.3	**Australia**	445	400	1.4
Italy	5,487	5,915	21.3	**Chile**	398	390	1.4
Spain	4,090	3,107	11.2	**Brazil**	311	311	1.1
ex USSR	1,570	1,800	6.5	**Austria**	317	300	1.1
United States	1,585	1,490	5.4	**Bulgaria**	293	293	1.1
Argentina	1,910	1,465	5.3	**Mexico**	163	145	0.5
Germany (*ex GFR*)	949	1,015	3.7	***ex Czechoslovakia***	142	134	0.5
Portugal	1,097	991	3.6	**Switzerland**	120	124	0.4
South Africa	952	963	3.5	**China**	90	95	0.3
Romania	598	600	2.2	**Uruguay**	90	80	0.3
Hungary	547	547	2.0	**Cyprus**	60	60	0.2
ex Yugoslavia	517	500	1.8	**Japan**	55	55	0.2

BEER (in thousands of gallons)

	1987 Prod.	1988 Prod.	% 1988		1987 Prod.	1988 Prod.	% 1988
World Total	26,310,489	27,462,190	100.0	Romania	280,950	290,600 (*)	1.1
United States	6,058,661	6,129,043	22.3	Korea, South	232,205	272,443	1.0
Germany	2,934,998	2,947,547	10.7	Hungary	238,969	249,009	0.9
China	1,427,816	1,733,152	6.3	Denmark	231,281	242,007	0.9
Great Britain (UK)	1,582,426	1,589,322	5.8	Austria	228,216	236,142	0.9
Japan	1,451,039	1,547,472	5.6	Peru	226,261	186,182	0.7
ex USSR	1,339,785	1,474,527	5.4	Bulgaria	164,121	167,291	0.6
Brazil	895,453	962,877	3.5	Portugal	131,492	144,306	0.5
Mexico	831,754	878,756	3.2	Argentina	154,848	138,229	0.5
Spain	654,899	660,500 (*)	2.4	Cameroon	154,742	134,874	0.5
Canada	634,000 (*)	634,000 (*)	2.3	Ireland	115,191	122,166	0.4
ex Czechoslovakia	587,264	598,941	2.2	Sweden	108,481	111,000 (*)	0.4
Australia	491,121	499,655	1.8	Switzerland	106,869	106,600 (*)	0.4
South Africa	441,478	478,995	1.8	New Zealand	107,979	103,699	0.4
Netherlands	463,671	463,143	1.7	Finland	92,708	99,127	0.4
Colombia	405,679	422,720	1.5	Cuba	86,869	87,820	0.3
Belgium	369,563	364,385	1.3	Kenya	81,294	83,012	0.3
Poland	314,319	329,880	1.2	Turkey	64,465	70,568	0.3
ex Yugoslavia	318,467	316,247	1.2				
Italy	303,909	306,181	1.1				

(*) Provisional data

Tubers, Vegetables, and Fruits

POTATOES (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	268,107	261,162	100.0	*ex Czechoslovakia*	2,534	2,713	1.0
ex USSR	63,700	64,500	24.7	Argentina	2,500	2,600	1.0
China	32,031	35,533	13.6	Iran	2,475	2,500	1.0
Poland	36,313	29,038	11.1	Colombia	2,464	2,372	0.9
United States	18,239	18,970	7.3	Italy	2,309	2,227	0.9
India	14,770	15,254	5.8	Brazil	2,219	2,214	0.8
Germany	14,039	10,225	3.9	*ex Yugoslavia*	2,172	2,180	0.8
Netherlands	7,036	6,735	2.6	Korea, North	2,100	1,975	0.8
Great Britain (UK)	6,504	6,700	2.6	Belgium–Luxembourg	1,750	1,950	0.7
France	5,800	6,300	2.4	Romania	3,186	1,900	0.7
Spain	5,342	5,333	2.0	Denmark	1,483	1,511	0.6
Turkey	4,300	4,600	1.8	Peru	1,154	1,450	0.6
Japan	3,552	3,700	1.4	South Africa	1,247	1,250	0.5
Canada	2,959	2,781	1.1	Hungary	1,226	1,226	0.5

DRIED LEGUMES (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	58,846	59,902	100.0	Mexico	1,520	1,661	2.8
India	12,931	14,007	23.4	Nigeria	1,463	1,559	2.6
ex USSR	9,710	8,320	13.9	Australia	1,342	1,345	2.2
China	6,135	6,915	11.5	Canada	604	884	1.5
France	3,718	3,294	5.5	Pakistan	773	806	1.3
Brazil	2,270	2,788	4.7	Ethiopia	748	763	1.3
Turkey	2,188	1,866	3.1	Great Britain (UK)	749	722	1.2
United States	1,624	1,746	2.9				

(continues)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
Poland	609	668	1.1	**Hungary**	318	333	0.6
Uganda	524	533	0.9	**Korea, North**	325	330	0.6
Indonesia	464	508	0.8	***ex Czechoslovakia***	254	316	0.5
Bangladesh	514	507	0.8	**Iran**	292	309	0.5
Myanmar (Burma)	425	484	0.8	**Nepal**	178	279	0.5
Thailand	459	474	0.8	**Argentina**	239	274	0.5
Morocco	414	439	0.7	**Malawi**	283	271	0.5
Tanzania	406	424	0.7	**Rwanda**	238	250	0.4
Denmark	551	410	0.7	**Kenya**	235	240	0.4
Niger	413	387	0.6	**Spain**	252	215	0.4
Egypt	531	381	0.6	**Italy**	199	208	0.3

CITRUS FRUITS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	72,997	77,322	100.0	**Egypt**	2,240	2,284	3.0
Brazil	18,606	20,048	25.9	**Iran**	1,998	2,110	2.7
United States	9,916	10,366	13.4	**Turkey**	1,696	1,696	2.2
China	5,781	6,305	8.2	**Pakistan**	1,588	1,599	2.1
Spain	4,684	4,378	5.7	**Argentina**	1,620	1,590	2.1
Italy	2,815	3,308	4.3	**Morocco**	1,038	1,288	1.7
Mexico	1,974	3,162	4.1	**Israel**	1,505	1,124	1.5
Japan	2,294	2,670	3.5	**Cuba**	1,017	1,013	1.3
India	2,525	2,595	3.4	**Greece**	1,160	939	1.2

BANANAS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	46,923	47,660	100.0	**Indonesia**	2,360	2,400	5.0
India	6,655	6,400	13.4	**China**	1,657	2,105	4.4
Brazil	5,502	5,630	11.8	**Mexico**	1,591	1,868	3.9
Philippines	3,409	3,545	7.4	**Colombia**	1,600	1,630	3.4
Ecuador	3,055	2,954	6.2	**Thailand**	1,613	1,620	3.4

PEARS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	9,509	9,359	100.0	**Korea, North**	115	120	1.3
China	2,483	2,728	29.1	**India**	105	115	1.2
Italy	968	864	9.2	**Austria**	100	98	1.0
United States	874	824	8.8	**Netherlands**	90	96	1.0
ex USSR	500	500	5.3	**Switzerland**	86	95	1.0
Japan	443	420	4.5	**Greece**	107	95	1.0
Turkey	413	420	4.5	**Portugal**	94	90	1.0
Spain	449	412	4.4	**Egypt**	75	76	0.8
France	331	280	3.0	**Romania**	74	65	0.7
Argentina	210	220	2.4	**Hungary**	64	64	0.7
Germany	380	210	2.2	**Belgium-Luxembourg**	59	60	0.6
South Africa	203	204	2.2	**Bulgaria**	62	57	0.6
ex Yugoslavia	164	170	1.8	**Poland**	35	53	0.6
Korea, South	159	165	1.8	**Mexico**	45	44	0.5
Chile	140	163	1.7	**Morocco**	41	44	0.5
Iran	125	130	1.4	***ex Czechoslovakia***	40	43	0.5
Australia	171	124	1.3				

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
Algeria	38	40	0.4	Syria	20	23	0.2
Great Britain (UK)	37	39	0.4	Brazil	18	18	0.2
Pakistan	33	34	0.4	New Zealand	15	16	0.2
Tunisia	25	30	0.3	Canada	17	15	0.2
Lebanon	24	25	0.3	Israel	19	15	0.2

PEACHES (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	8,902	8,682	100.0	Hungary	72	72	0.8
Italy	1,720	1,389	16.0	Australia	68	72	0.8
United States	1,181	1,316	15.2	Bulgaria	80	70	0.8
Greece	756	824	9.5	Syria	66	60	0.7
China	786	808	9.3	Romania	53	40	0.5
Spain	629	691	8.0	Algeria	37	40	0.5
France	492	450	5.2	Israel	44	39	0.4
ex USSR	450	420	4.8	Canada	47	36	0.4
Turkey	350	360	4.1	Egypt	35	36	0.4
Argentina	250	200	2.3	Morocco	30	32	0.4
Japan	190	193	2.2	Tunisia	25	27	0.3
Chile	215	180	2.1	New Zealand	27	26	0.3
Mexico	175	175	2.0	Peru	24	25	0.3
Iran	175	175	2.0	Iraq	29	24	0.3
South Africa	146	153	1.8	Pakistan	22	23	0.3
Korea, South	115	122	1.4	Bolivia	20	22	0.3
Korea, North	105	110	1.3	*ex Czechoslovakia*	22	15	0.2
Brazil	100	105	1.2	Uruguay	15	14	0.2
Portugal	89	90	1.0	Lebanon	12	13	0.1
ex Yugoslavia	85	80	0.9	Libya	11	12	0.1
India	70	75	0.9	Germany	28	11	0.1

PLUMS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Pr	
World Total	5,736	5,651	100.0	India	50	52	0.9
ex USSR	1,000	950	16.8	Syria	43	50	0.9
China	875	946	16.7	*ex Czechoslovakia*	41	47	0.8
United States	665	705	12.5	Egypt	45	46	0.8
ex Yugoslavia	499	550	9.7	Austria	26	40	0.7
Romania	450	360	6.4	Algeria	33	35	0.6
Germany	337	233	4.1	Afghanistan	34	34	0.6
Turkey	188	190	3.4	Iraq	35	27	0.5
France	189	190	3.4	Korea, South	25	26	0.5
Spain	120	148	2.6	Israel	25	25	0.4
Italy	139	121	2.1	Great Britain (UK)	8	25	0.4
Hungary	152	110	1.9	Australia	20	20	0.4
Bulgaria	123	103	1.8	South Africa	18	18	0.3
Chile	88	101	1.8	Lebanon	15	16	0.3
Mexico	86	87	1.5	Norway	13	13	0.2
Poland	43	67	1.2	Switzerland	13	11	0.2
Japan	97	65	1.2	Portugal	9	11	0.2
Argentina	55	54	1.0	Greece	8	8	0.1
Pakistan	51	52	0.9	Albania	10	7	0.1
Morocco	50	52	0.9	Tunisia	7	7	0.1

Oilseeds

COTTONSEED (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	33,930	38,052	100.0	**Mali**	121	180	0.5
China	9,016	11,326	29.8	**Nigeria**	180	180	0.5
United States	5,415	6,132	16.1	**Ivory Coast**	137	168	0.4
ex USSR	5,065	4,700	12.4	**Sudan**	165	162	0.4
Pakistan	3,275	4,225	11.1	**Spain**	121	132	0.3
India	3,322	3,404	8.9	**Zimbabwe**	113	125	0.3
Brazil	1,088	1,130	3.0	**Tanzania**	91	124	0.3
Turkey	977	904	2.4	**Peru**	150	115	0.3
Australia	493	689	1.8	**Chad**	95	100	0.3
Egypt	504	485	1.3	**Burkina Faso**	98	98	0.3
Argentina	450	485	1.3	**South Africa**	95	95	0.2
Paraguay	365	410	1.1	**Benin**	80	93	0.2
Greece	420	365	1.0	**Thailand**	64	69	0.2
Syria	274	344	0.9	**Cameroon**	69	65	0.2
Mexico	294	309	0.8	**Mozambique**	64	60	0.2
Colombia	265	278	0.7	**Guatemala**	57	60	0.2
Iran	250	268	0.7	**Togo**	38	55	0.1

LINSEED (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	2,821	2,623	100.0	**Egypt**	20	22	0.8
Canada	935	691	26.3	**Brazil**	20	20	0.8
China	430	410	15.6	**Afghanistan**	14	14	0.5
Argentina	440	375	14.3	***ex Czechslovakia***	16	13	0.5
India	326	339	12.9	**Hungary**	10	11	0.4
Great Britain (UK)	70	185	7.1	**Belgium–Luxembourg**	9	9	0.3
United States	97	155	5.9	**Netherlands**	8	9	0.3
ex USSR	197	140	5.3	**Australia**	6	6	0.2
Romania	50	52	2.0	**Poland**	11	5	0.2
Bangladesh	48	45	1.7	**Pakistan**	4	5	0.2
France	40	44	1.7	**Tunisia**	4	4	0.2
Ethiopia	27	29	1.1	**Uruguay**	1	4	0.2
Nepal	26	26	1.0	**Mexico**	3	3	0.1

SOYBEANS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	108,134	103,065	100.0	**Italy**	1,751	1,325	1.3
United States	52,416	54,039	52.4	**Paraguay**	1,795	1,304	1.3
Brazil	19,888	14,771	14.3	***ex USSR***	880	760	0.7
Argentina	10,700	11,250	10.9	**Mexico**	575	718	0.7
China	11,008	9,807	9.5	**Thailand**	578	605	0.6
India	2,419	2,100	2.0	**Korea, North**	455	460	0.4
Indonesia	1,487	1,549	1.5	**Bolivia**	233	384	0.4
Canada	1,292	1,406	1.4	**Japan**	220	260	0.3

PEANUTS (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	23,410	23,366	100.0	Nigeria	1,166	1,219	5.2
India	7,622	7,000	30.0	Indonesia	930	920	3.9
China	6,433	6,060	25.9	Senegal	703	700	3.0
United States	1,634	2,242	9.6	Myanmar (Burma)	459	505	2.2

OLIVE OIL (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	1,573	2,007	100.0	Portugal	27	26	1.3
Italy	175	685	34.1	Algeria	8	16	0.8
Spain	679	608	30.3	Jordan	8	11	0.5
Greece	188	355	17.7	Libya	10	[illegible]	0.5
Turkey	110	96	4.8	Argentina	8	9	0.4
Tunisia	182	75	3.7	Lebanon	5	4	0.2
Morocco	43	53	2.6	Albania	4	3	0.1
Syria	91	43	2.1	*ex Yugoslavia*	6	3	0.1

PALM OIL (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	11,163	11,873	100.0	Papua New Guinea	114	114	1.0
Malaysia	6,095	6,145	51.8	Cameroon	108	105	0.9
Indonesia	2,186	2,700	22.7	Ghana	85	87	0.7
Nigeria	820	900	7.6	Honduras	78	80	0.7
Colombia	252	268	2.3	Brazil	66	70	0.6
Thailand	226	234	2.0	Costa Rica	60	64	0.5
Ivory Coast	208	218	1.8	Sierra Leone	56	59	0.5
Zaire	180	182	1.5	Guinea	50	51	0.4
Ecuador	150	156	1.3	Angola	40	40	0.3
China	133	140	1.2	Benin	40	40	0.3

Textile Fibers

COTTON FIBER (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	18,447	20,641	100.0	Colombia	140	142	0.7
China	4,508	5,663	27.4	Ivory Coast	116	133	0.6
United States	3,375	3,919	19.0	Mali	99	115	0.6
ex USSR	2,634	2,420	11.7	Sudan	83	91	0.4
Pakistan	1,637	2,112	10.2	Spain	75	83	0.4
India	1,659	1,700	8.2	Burkina Faso	77	77	0.4
Brazil	660	700	3.4	Zimbabwe	67	73	0.4
Turkey	611	565	2.7	Benin	59	67	0.3
Australia	305	433	2.1	Peru	73	65	0.3
Egypt	303	294	1.4	Tanzania	47	64	0.3
Argentina	270	290	1.4	South Africa	53	61	0.3
Paraguay	215	259	1.3	Chad	60	60	0.3
Mexico	201	202	1.0	Nigeria	36	45	0.2
Syria	159	200	1.0	Guatemala	41	38	0.2
Greece	209	190	0.9	Cameroon	44	35	0.2
Iran	138	146	0.7	Thailand	32	35	0.2

FLAX (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	719	716	100.0	Egypt	14	15	2.1
ex USSR	245	270	37.7	*ex Czechoslovakia*	22	8	1.1
China	243	242	33.8	Poland	16	5	0.7
France	77	79	11.0	Argentina	2	2	0.3
Romania	39	40	5.6	Chile	2	2	0.3
Netherlands	40	35	4.9	Hungary	1	1	0.1
Belgium–Luxembourg	16	17	2.4	Bulgaria	2	1	0.1

JUTE (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	3,669	3,682	100.0	*ex USSR*	49	52	1.4
India	1,638	1,620	44.0	Vietnam	29	32	0.9
Bangladesh	879	977	26.5	Myanmar (Burma)	34	29	0.8
China	726	680	18.5	Indonesia	18	19	0.5
Thailand	205	189	5.1	Brazil	22	16	0.4

HEMP (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	206	205	100.0	Pakistan	5	5	2.4
China	72	68	33.2	Turkey	4	4	2.0
India	40	40	19.5	Chile	4	4	2.0
Romania	38	40	19.5	*ex Czechoslovakia*	3	3	1.5
ex USSR	25	25	12.2	Hungary	2	2	1.0
Korea, North	10	10	4.9	*ex Yugoslavia*	2	2	1.0

SISAL (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	377	386	100.0	Tanzania	38	40	10.4
Brazil	185	185	47.9	Kenya	40	39	10.1
Mexico	39	45	11.7	Madagascar	21	21	5.4

WOOL – washed wool (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	1,897	1,839	100.0	Romania	27	28	1.5
Australia	548	548	29.8	Turkey	24	28	1.5
ex USSR	283	268	14.6	India	22	23	1.3
New Zealand	272	226	12.3	United States	21	22	1.2
China	122	123	6.7	Syria	18	19	1.0
Argentina	75	67	3.6	Spain	18	18	1.0
Uruguay	59	64	3.5	Brazil	17	18	1.0
Great Britain (UK)	53	53	2.9	Iran	18	18	1.0
South Africa	50	51	2.8	Morocco	17	17	0.9
Pakistan	37	39	2.1	Bulgaria	14	17	0.9

SILK (in metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	86,474	90,872	100.0	Thailand	1,250	1,300	1.43
China	55,047	58,051	63.88	Iran	537	537	0.59
India	11,000	11,900	13.10	Vietnam	500	500	0.55
Japan	6,000	6,000	6.60	Turkey	270	270	0.30
Korea, North	4,200	4,400	4.84	Romania	150	150	0.17
ex USSR	4,094	4,100	4.51	Bulgaria	150	150	0.17
Brazil	1,693	1,929	2.12	Afghanistan	60	60	0.07
Korea, South	1,400	1,400	1.54	*ex Yugoslavia*	45	45	0.05

Wood and Wood Products

WOODLAND AND FOREST AREAS (in thousands of square miles)

	Total area	Forest area (1990)	% total area	% world total		Total area	Forest area (1990)	% total area	% world total
World Total	51,698	15,547	30.1	100.0	Argentina	1,068	229	21.4	1.5
ex USSR	8,648	3,655	42.3	23.5	Bolivia	424	215	50.6	1.4
Brazil	3,286	1,903	57.9	12.2	Angola	481	201	41.7	1.3
Canada	3,851	1,386	36.0	8.9	Colombia	440	194	44.2	1.2
United States	3,618	1,133	31.3	7.3	Sudan	967	173	17.9	1.1
Zaire	905	673	74 3	4.3	Mexico	756	164	21.7	1.1
China	3,704	488	13.2	3.1	Tanzania	365	158	43.3	1.0
Indonesia	735	438	59.5	2.8	Papua New Guinea	179	147	82.5	0.9
Australia	2,977	409	13.7	2.6	Central Afr. Rep.	241	138	57.5	0.9
Peru	496	264	53.2	1.7	Myanmar (Burma)	261	125	47.9	0.8
India	1,269	257	20.3	1.7					

WOOD (in thousands of cubic feet)

	1988 Prod.	1989 Prod.	% 1989		1987 Prod.	1988 Prod.	% 1988
World Total	121,187,300	122,242,559	100.0	Finland	1,581,511	1,633,049	1.3
United States	18,701,763	18,820,830	15.4	Malaysia	1,704,990	1,783,956	1.5
ex USSR	13,897,610	13,488,130	11.0	France	1,543,563	1,543,563	1.3
China	9,744,953	9,693,027	7.9	Ethiopia	1,371,017	1,399,292	1.1
India	9,333,744	9,511,620	7.8	Philippines	1,352,343	1,359,156	1.1
Brazil	8,883,280	9,017,562	7.4	Thailand	1,348,954	1,348,954	1.1
Canada	6,352,482	6,247,253	5.1	Kenya	1,206,660	1,258,445	1.0
Indonesia	6,128,009	6,203,269	5.1	Germany (*ex GFR*)	1,156,534	1,247,220	1.0
Nigeria	3,702,299	3,822,919	3.1	Zaire	1,208,637	1,247,784	1.0
Sweden	1,903,517	1,966,351	1.6	Tanzania	1,128,012	1,168,536	1.0

WOOD PULP (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	152,713	153,706	100.0	Finland	9,001	9,118	5.9
United States	55,530	56,225	36.6	Brazil	4,375	4,304	2.8
Canada	23,550	23,593	15.3	Germany (*ex GFR*)	2,358	2,418	1.6
ex USSR	11,818	11,326	7.4	Norway	2,103	2,224	1.4
Japan	10,406	10,409	6.8	France	2,058	2,135	1.4
Sweden	10,074	10,052	6.5	China	1,778	1,791	1.2

PAPER (in thousands of metric tons)

	Newsprint	Other	1989 total	% 1989		Newsprint	Other	1989 total	% 1989
World Total	32,314	198,648	230,962	90.1	**Finland**	1,298	7,454	8,752	3.4
United States	5,523	63,991	69,514	27.1	**Sweden**	2,165	6,197	8,362	3.3
Japan	3,217	23,592	26,809	10.5	**France**	379	6,375	6,754	2.6
Canada	9,678	6,877	16,555	6.5	**Italy**	258	5,297	5,555	2.2
China	718	14,618	15,336	6.0	**Brazil**	230	4,576	4,806	1.9
Germany					**Great Britain**	572	3,903	4,475	1.7
(ex GFR)	991	10,268	11,259	4.4	**Korea, South**	444	3,574	4,018	1.6
ex USSR	1,719	8,935	10,654	4.2	**Spain**	165	3,281	3,446	1.3

NATURAL RUBBER (in thousands of metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	4,922	5,092	100.0	**Sri Lanka**	113	102	2.0
Indonesia	1,246	1,284	25.2	**Ivory Coast**	74	74	1.5
Malaysia	1,292	1,250	24.5	**Vietnam**	52	55	1.1
Thailand	1,100	1,200	23.6	**Cameroon**	38	40	0.8
India	297	330	6.5	**Brazil**	33	35	0.7
China	264	280	5.5	**Cambodia**	38	30	0.6
Philippines	185	201	3.9	**Guatemala**	18	18	0.4
Nigeria	88	137	2.7	**Myanmar (Burma)**	15	15	0.3

Livestock and Fishing

MEADOWS AND PASTURELAND (in thousands of square miles)

	Total area	Pasture area (1990)	% total area (1990)	% world total		Total area	Pasture area (1990)	% total area (1990)	% world total
World Total	51,692	13,132	25.4	100.0	**Mexico**	756	288	38.0	2.2
Australia	2,977	1,612	54.1	12.3	**Chad**	496	174	35.0	1.3
China	3,704	1,544	41.7	11.8	**Ethiopia**	472	173	36.7	1.3
ex USSR	8,648	1,425	16.5	10.9	**Iran**	636	170	26.7	1.3
Brazil	3,286	711	21.6	5.4	**Mozambique**	310	170	54.9	1.3
Argentina	1,068	549	51.4	4.2	**Colombia**	440	156	35.5	1.2
Mongolia	604	480	79.4	3.7	**Mauritania**	396	152	38.3	1.2
Sudan	967	425	43.9	3.3	**Namibia**	318	147	46.1	1.1
Saudi Arabia	830	328	39.5	2.5	**Tanzania**	365	135	37.0	1.0
South Africa	471	314	66.7	2.4	**Botswana**	225	127	56.7	1.0

CATTLE (in thousands of head)

	1990	1991	% 1991		1990	1991	% 1991
World Total	1,293,641	1,294,604	100.0	**Ethiopia**	30,000	30,000	2.3
India	197,300	198,400	15.3	**Mexico**	32,054	29,847	2.3
Brazil	148,000	152,000	11.7	**Colombia**	24,550	24,875	1.9
ex USSR	118,400	115,600	8.9	**Bangladesh**	23,244	23,500	1.8
United States	98,162	98,896	7.6	**Australia**	23,191	23,430	1.8
China	79,493	81,407	6.3	**France**	21,419	21,446	1.7
Argentina	50,582	50,080	3.9				

(continues)

	1990	1991	% 1991		1990	1991	% 1991
Sudan	20,583	21,028	1.6	Indonesia	10,550	10,350	0.8
Germany	20,287	19,488	1.5	Madagascar	10,254	10,265	0.8
Pakistan	17,573	17,785	1.4	Myanmar (Burma)	9,298	9,310	0.7
Nigeria	13,947	14,500	1.1	Uruguay	8,723	8,889	0.7
Kenya	13,793	13,700	1.1	Poland	10,049	8,844	0.7
Venezuela	13,272	13,686	1.1	Italy	8,746	8,647	0.7
South Africa	13,398	13,512	1.0	Paraguay	8,254	8,260	0.6
Tanzania	13,047	13,138	1.0	New Zealand	8,065	8,200	0.6
Canada	12,249	12,369	1.0	Iran	6,650	6,800	0.5
Great Britain (UK)	11,922	11,846	0.9	Nepal	6,281	6,350	0.5
Turkey	12,173	11,377	0.9	Ireland	5,899	6,029	0.5

SHEEP (in thousands of head)

	1990	1991	% 1991		1990	1991	% 1991
World Total	1,215,633	1,202,920	100.0	Ethiopia	22,960	23,000	1.9
Australia	170,297	162,774	13.5	Sudan	20,168	20,700	1.7
ex USSR	138,400	134,000	11.1	Brazil	20,100	20,300	1.7
China	113,508	112,820	9.4	Syria	14,509	15,321	1.3
New Zealand	57,852	57,000	4.7	Mongolia	14,265	15,083	1.3
India	54,588	55,700	4.6	Romania	15,435	14,062	1.2
Iran	45,000	45,000	3.7	Morocco	14,000	14,000	1.2
Turkey	43,647	40,553	3.4	Somalia	14,000	13,800	1.1
South Africa	32,665	32,580	2.7	Afghanistan	13,500	13,500	1.1
Pakistan	29,239	30,160	2.5	Algeria	13,350	13,350	1.1
Great Britain (UK)	29,521	29,954	2.5	Bolivia	12,220	12,300	1.0
Argentina	28,571	27,552	2.3	Italy	11,569	11,575	1.0
Uruguay	25,220	25,986	2.2	France	11,790	11,490	1.0
Spain	24,037	24,500	2.0	Peru	12,257	11,250	0.9
Nigeria	22,104	24,000	2.0	United States	11,364	11,200	0.9

GOATS (in thousands of head)

	1990	1991	% 1991		1990	1991	% 1991
World Total	587,065	594,286	100.0	Turkey	11,942	10,977	1.8
India	110,000	112,000	18.8	Mexico	10,439	10,772	1.8
China	98,313	97,378	16.4	Tanzania	8,526	8,814	1.5
Pakistan	35,412	36,673	6.2	Kenya	8,000	8,100	1.4
Nigeria	34,495	36,000	6.1	*ex USSR*	7,000	6,600	1.1
Iran	23,500	23,500	4.0	Burkina Faso	5,700	6,137	1.0
Bangladesh	21,031	22,000	3.7	Greece	5,904	5,918	1.0
Somalia	21,000	20,500	3.4	South Africa	5,880	5,900	1.0
Ethiopia	17,200	18,000	3.0	Mali	5,850	5,850	1.0
Sudan	14,843	15,227	2.6	Nepal	5,324	5,355	0.9
Brazil	12,000	12,500	2.1	Morocco	5,300	5,300	0.9
Indonesia	11,250	11,300	1.9	Mongolia	4,959	5,126	0.9

HORSES (in thousands of head)

	1990	1991	% 1991		1990	1991	% 1991
World Total	61,164	61,620	100.0	Mexico	6,170	6,175	10.0
China	10,294	10,174	16.5	*ex USSR*	5,920	5,900	9.6
[illegible]	6,000	6,200	10.1				

(continues)

	1990	1991	% 1991		1990	1991	% 1991
United States	5,400	5,630	9.2	**Cuba**	629	629	1.0
Argentina	3,400	3,400	5.5	**Chile**	520	520	0.8
Ethiopia	2,650	2,700	4.4	**Turkey**	545	513	0.8
Mongolia	2,200	2,255	3.7	**Ecuador**	492	512	0.8
Colombia	1,975	1,980	3.2	**Venezuela**	495	495	0.8
India	960	965	1.6	**Germany**	484	491	0.8
Poland	941	939	1.5	**Uruguay**	465	470	0.8
Indonesia	740	750	1.2	**Pakistan**	460	461	0.7
Romania	663	670	1.1	**Haiti**	435	435	0.7
Peru	660	660	1.1	**Canada**	415	415	0.7

PIGS (in thousands of head)

	1990	1991	% 1991		1990	1991	% 1991
World Total	855,870	857,099	100.0	**Japan**	11,816	11,335	1.3
China	360,594	363,975	42.5	**Canada**	10,370	10,516	1.2
ex USSR	78,900	75,600	8.8	**India**	10,400	10,450	1.2
United States	53,821	54,427	6.4	**Italy**	9,254	9,520	1.1
Brazil	34,000	35,000	4.1	**Denmark**	9,282	9,489	1.1
Germany	34,178	30,819	3.6	**Philippines**	8,124	8,007	0.9
Poland	19,464	21,868	2.6	**Hungary**	7,600	8,000	0.9
Spain	16,002	16,100	1.9	**Great Britain (UK)**	7,383	7,379	0.9
Mexico	15,203	15,902	1.9	***ex Yugoslavia***	7,231	7,358	0.9
Netherlands	13,634	13,788	1.6	***ex Czechoslovakia***	7,498	7,090	0.8
Vietnam	12,221	12,583	1.5	**Indonesia**	7,650	6,800	0.8
France	12,366	12,239	1.4	**Belgium–Luxembourg**	6,440	6,421	0.7
Romania	11,671	12,003	1.4	**Thailand**	4,900	5,000	0.6

DOMESTIC FOWL (in thousands of head)

	1990	1991	% 1991		1990	1991	% 1991
World Total	11,578	11,978	100.0	**Pakistan**	170	193	1.6
China	2,347	2,446	20.4	**Nigeria**	123	170	1.4
United States	1,556	1,623	13.5	**Iran**	162	167	1.4
ex USSR	1,198	1,206	10.1	**Italy**	161	162	1.4
Indonesia	609	620	5.2	**Malaysia**	150	153	1.3
Brazil	561	582	4.9	**Great Britain (UK)**	131	134	1.1
India	350	380	3.2	**Thailand**	125	131	1.1
Japan	338	335	2.8	**Romania**	120	127	1.1
Mexico	248	259	2.2	**Canada**	116	120	1.0
France	249	258	2.2	**Germany**	126	112	0.9

FISH CATCH (in thousands of metric tons)

	1988	1989	% 1989		1988	1989	% 1989
World Total	98,762	99,535	100.0	**Japan**	11,967	11,174	11.2
ex USSR	11,332	11,310	11.4	**Peru**	6,638	6,832	6.9
China	10,359	11,220	11.3				

(continues)

	1988	1989	% 1989		1988	1989	% 1989
Chile	5,210	6,454	6.5	Ecuador	771	724	0.7
United States	5,937	5,744	5.8	Myanmar (Burma)	705	703	0.7
India	3,126	3,619	3.6	Malaysia	612	609	0.6
Korea, South	2,727	2,832	2.8	Poland	655	565	0.6
Thailand	2,822	2,823	2.8	Italy	577	551	0.6
Indonesia	2,703	2,700	2.7	Morocco	552	520	0.5
Denmark	2,331	2,221	2.2	Argentina	493	487	0.5
Philippines	2,010	2,099	2.1	Turkey	676	457	0.5
Norway	1,840	1,900	1.9	Pakistan	445	445	0.4
Korea, North	1,700	1,700	1.7	Netherlands	399	422	0.4
Canada	1,597	1,554	1.6	Tanzania	393	387	0.4
Iceland	1,759	1,505	1.5	Ghana	362	362	0.4
Mexico	1,372	1,417	1.4	Portugal	347	332	0.3
Spain	1,430	1,370	1.4	Venezuela	283	327	0.3
South Africa	1,298	879	0.9	Senegal	259	269	0.3
France	883	876	0.9	Nigeria	261	260	0.3
Vietnam	874	868	0.9	Sweden	251	258	0.3
Brazil	829	850	0.9	Egypt	250	254	0.3
Bangladesh	830	833	0.8	Ireland	256	245	0.2
Great Britain (UK)	937	823	0.8	Hong Kong	238	243	0.2

Dairy Products

BUTTER (in metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	7,775,288	7,450,408	100.0	Ireland	148,000	151,000	2.0
ex USSR	1,802,000	1,570,000	21.1	*ex Czechoslovakia*	157,529	132,799	1.8
India	970,000	1,040,000	14.0	Turkey	113,400	114,200	1.5
Germany	665,200	652,000	8.8	Great Britain (UK)	138,372	114,000	1.5
United States	607,700	634,000	8.5	Australia	105,510	104,000	1.4
France	527,000	500,000	6.7	Canada	104,447	101,193	1.4
Pakistan	280,834	298,134	4.0	Belgium–Luxembourg	87,000	85,000	1.1
New Zealand	258,100	292,000	3.9	Denmark	93,300	82,000	1.1
Poland	315,000	225,000	3.0	Egypt	78,975	79,550	1.1
Netherlands	178,000	165,000	2.2	Italy	79,000	76,000	1.0

CHEESE (in metric tons)

	1990 Prod.	1991 Prod.	% 1991		1990 Prod.	1991 Prod.	% 1991
World Total	14,539,259	14,163,370	100.0	Canada	286,228	290,721	2.1
United States	3,127,000	3,090,100	21.8	Denmark	295,000	290,000	2.0
ex USSR	2,064,000	1,845,000	13.0	Argentina	270,000	280,000	2.0
France	1,363,000	1,425,000	10.1	Greece	198,667	207,000	1.5
Germany	1,341,872	1,193,357	8.4	Iran	182,785	183,982	1.3
Italy	699,899	692,486	4.9	Bulgaria	191,800	181,400	1.3
Netherlands	584,275	614,275	4.3	*ex Czechoslovakia*	204,609	180,564	1.3
Egypt	311,250	318,750	2.3	Australia	175,333	176,260	1.2
Great Britain (UK)	312,000	310,000	2.2	Spain	156,102	155,102	1.1
Poland	332,699	292,780	2.1	China	145,240	142,909	1.0

Table 8 — Economic production: Minerals and metallurgy
Minerals and fossil fuels

ANTHRACITE AND FOSSIL COAL (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		88 Prod.	1989 Prod.	% 19
World Total	3,453,970	3,474,184	100.00	**France**	12,893	12,296	0.35
China (*)	946,460	1,040,000	29.94	**Mexico**	10,586	10,575	0.30
United States	784,864	810,034	23.32	**Japan**	11,223	10,187	0.29
ex USSR	599,000	502,844	14.47	**Romania**	8,831	8,289	0.24
India	189,021	198,659	5.72	**Brazil**	7,331	6,536	0.19
Poland	193,015	177,633	5.11	**Vietnam**	5,500	5,400	0.16
South Africa	178,820	174,711	5.03	**Zimbabwe**	5,065	5,111	0.15
Australia	134,807	147,778	4.25	**Indonesia**	2,741	4,553	0.13
Great Britain (UK)	101,791	98,285	2.83	**Belgium**	3,439	3,632	0.10
Germany (*ex GFR*)	79,319	77,451	2.23	**Turkey**	3,256	3,200	0.09
Korea, North	40,000	40,500	1.17	**Pakistan**	2,750	2,619	0.08
Canada	38,585	38,794	1.12	**New Zealand**	2,106	2,462	0.07
ex Czechoslovakia	25,478	24,681	0.71	**Hungary**	2,255	2,127	0.06
Korea, South	24,295	20,785	0.60	**Venezuela**	1,072	2,098	0.06
Colombia	15,101	18,969	0.55	**Philippines**	1,336	1,360	0.04
Chile	15,101	18,969	0.55				
Spain	14,205	14,525	0.42				

(*) Including lignite

LIGNITE (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	1,257,466	1,256,777	100.0	**Greece**	48,323	51,866	4.1
Germany	418,936	410,934	32.7	**Australia**	43,398	48,289	3.8
ex USSR	196,100	187,916	15.0	**Turkey**	35,962	36,000	2.9
ex Czechoslovakia	97,999	92,083	7.3	**Bulgaria**	33,951	34,105	2.7
United States	77,202	78,625	6.3	**Canada**	32,058	31,733	2.5
ex Yugoslavia	70,498	74,339	5.9	**Spain**	17,635	21,926	1.7
Poland	73,489	71,816	5.7	**Hungary**	18,620	17,903	1.4
Romania	49,280	52,210	4.2	**Korea, North**	12,500	13,000	1.0

PETROLEUM (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	2,956,964	3,015,699	100.0	**Egypt**	42,999	43,952	1.5
ex USSR	601,500	565,500	18.8	**Algeria**	34,064	37,021	1.2
United States	382,637	369,679	12.3	**Oman**	31,803	34,018	1.1
Saudi Arabia	252,433	320,375	10.6	**India**	33,685	33,311	1.1
Iran	140,426	157,082	5.2	**Brazil**	29,845	31,612	1.0
China	137,450	138,100	4.6	**Malaysia**	28,399	30,028	1.0
Mexico	130,665	133,085	4.4	**Australia**	22,540	25,502	0.8
Venezuela	100,090	112,009	3.7	**Argentina**	23,641	24,784	0.8
United Arab Emir.	89,256	101,959	3.4	**Angola**	22,642	23,553	0.8
Iraq	136,603	100,638	3.3	**Syria**	18,329	22,941	0.8
Great Britain (UK)	87,404	88,010	2.9	**Colombia**	20,382	22,155	0.7
Nigeria	85,175	86,538	2.9	**Qatar**	19,064	19,062	0.6
Norway	72,609	79,648	2.6	**Ecuador**	14,556	14,936	0.5
Canada	76,539	76,315	2.5	**Gabon**	10,227	13,493	0.4
Indonesia	69,323	70,388	2.3	**Cameroon**	8,635	8,480	0.3
Libya	54,320	67,162	2.2	**Yemen**	8,982	8,468	0.3
Kuwait	74,051	59,550	2.0	**Congo**	7,962	8,076	0.3

NATURAL GAS (in billions of cubic feet)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	69,188	71,659	100.0	Romania	1,299	1,161	1.6
ex USSR	27,252	27,181	37.9	Norway	1,094	1,130	1.6
United States	16,662	17,251	24.1	Indonesia	1,193	1,097	1.5
Canada	3,481	3,392	4.7	Venezuela	674	706	1.0
Netherlands	2,316	2,524	3.5	Argentina	702	702	1.0
Great Britain (UK)	1,588	1,723	2.4	Italy	582	593	0.8
Algeria	1,624	1,694	2.4	Australia	537	565	0.8
Mexico	1,571	1,539	2.1	Germany (*ex GFR*)	526	519	0.7

URANIUM (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	38,412	31,893	100.0	France	3,241	2,841	8.9
Canada	11,323	8,729	27.4	Niger	2,962	2,831	8.9
Australia	3,655	3,530	11.1	South Africa	2,943	2,487	7.8
United States	5,320	3,420	10.7	Gabon	870	700	2.2
Namibia	3,077	3,200	10.0	Hungary	530	524	1.6
Germany	3,717	2,972	9.3	Spain	227	213	0.7

Metal Ores

IRON (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	565,403	570,190	100.00	Spain	1,925	2,286	0.40
ex USSR	138,217	134,789	23.64	Turkey	2,983	1,947	0.34
Brazil	99,285	104,516	18.33	*ex Yugoslavia*	1,844	1,683	0.30
China	77,190	81,078	14.22	Algeria	1,559	–	–
Australia	65,080	62,142	10.90	Norway	1,681	1,529	0.27
United States	36,468	37,188	6.52	Egypt	1,054	1,290	0.23
India	32,085	34,140	5.99	Iran	1,036	–	–
Canada	24,302	24,061	4.22	Austria	767	804	0.14
South Africa	15,805	18,754	3.29	Zimbabwe	610	686	0.12
Sweden	12,670	13,455	2.36	Romania	496	514	0.09
Venezuela	12,116	11,770	2.06	Bulgaria	528	483	0.08
Liberia	8,011	–	–	*ex Czechoslovakia*	474	476	0.08
Mauritania	6,500	–	–	Argentina	379	414	0.07
Chile	4,801	5,313	0.93	Korea, South	372	379	0.07
Korea, North	3,600	–	–	Colombia	283	261	0.05
Mexico	5,564	3,394	0.60	Tunisia	173	146	0.03
Peru	2,839	2,908	0.51	Malaysia	113	108	0.02
France	3,225	2,905	0.51	Thailand	57	103	0.02

LEAD (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	3,304.1	3,315.7	100.0	Canada	276.1	232.1	7.0
Australia	495.0	560.5	16.9	Peru	193.1	188.9	5.7
United States	419.3	495.2	14.9	Mexico	180.1	180.0	5.4
ex USSR	500.0	490.0	14.8	Sweden	83.2	84.2	2.5
China	341.4	315.3	9.5				

(continued)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
ex Yugoslavia	79.0	83.0	2.5	**Greece**	24.5	26.2	0.8
South Africa	78.2	70.2	2.1	**India**	25.0	25.0	0.8
Morocco	64.7	66.9	2.0	**Argentina**	26.7	23.4	0.7
Spain	62.6	61.5	1.9	**Thailand**	24.4	22.2	0.7
Korea, North	70.0	60.0	1.8	**Namibia**	23.9	20.7	0.6
Poland	51.1	45.4	1.4	**Bolivia**	15.7	19.9	0.6
Bulgaria	49.5	45.2	1.4	**Japan**	18.6	18.7	0.6
Ireland	32.1	35.3	1.1	**Korea, South**	16.5	18.7	0.6

ZINC (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	7,119.7	7,298.7	100.0	**Sweden**	168.0	159.9	2.2
Canada	1,216.1	1,175.8	16.1	**Poland**	170.0	154.8	2.1
Australia	803.0	938.6	12.9	**Japan**	131.8	127.3	1.7
ex USSR	940.0	870.0	11.9	**Brazil**	105.8	110.0	1.5
China	620.4	618.9	8.5	**Bolivia**	74.8	107.9	1.5
Peru	598.1	585.1	8.0	**Thailand**	86.6	80.8	1.1
United States	288.3	538.2	7.4	***ex Yugoslavia***	75.0	76.0	1.0
Mexico	314.7	298.9	4.1	**South Africa**	77.3	74.5	1.0
Spain	265.3	257.5	3.5	**India**	65.2	70.0	1.0
Korea, North	200.0	195.0	2.7	**Zaire**	72.8	61.8	0.8
Ireland	168.8	166.5	2.3	**Germany (*ex GFR*)**	63.9	58.1	0.8

TIN (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	224,000	210,700	100.0	**Bolivia**	15,800	17,300	8.2
Brazil	50,200	39,100	18.6	**Thailand**	14,700	14,600	6.9
China	33,000	35,800	17.0	***ex USSR***	14,000	13,000	6.2
Indonesia	31,600	31,700	15.0	**Australia**	7,800	7,400	3.5
Malaysia	32,000	28,500	13.5	**Peru**	5,100	5,100	2.4

COPPER (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	9,091.2	9,037.9	100.0	**Philippines**	193.1	182.3	2.0
Chile	1,609.3	1,588.4	17.6	**Papua New Guinea**	205.1	170.2	1.9
United States	1,497.8	1,587.2	17.6	**Indonesia**	148.6	169.5	1.9
ex USSR	950.0	900.0	10.0	**Portugal**	103.4	157.5	1.7
Canada	723.1	802.0	8.9	**Mongolia**	135.0	140.0	1.5
Zambia	510.2	496.0	5.5	***ex Yugoslavia***	119.0	119.0	1.3
China	380.0	360.0	4.0	**Sweden**	69.8	73.5	0.8
Zaire	454.6	356.2	3.9	**Iran**	56.2	62.3	0.7
Poland	385.0	329.3	3.6	**India**	53.3	51.6	0.6
Australia	295.0	327.0	3.6	**Turkey**	38.1	43.8	0.5
Peru	364.1	317.7	3.5	**Brazil**	44.4	36.5	0.4
Mexico	262.3	291.3	3.2	**Bulgaria**	38.8	32.9	0.4
South Africa	196.6	209.9	2.3	**Namibia**	31.6	32.5	0.4

BAUXITE (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	102,845	109,115	100.0	*ex Yugoslavia*	3,252	2,953	2.7
Australia	37,355	39,914	36.6	**Hungary**	2,644	2,559	2.3
Guinea	17,547	17,524	16.1	**Greece**	2,522	2,455	2.2
Suriname	3,457	13,267	12.2	**Sierra Leone**	1,562	1,445	1.3
Jamaica	9,487	10,937	10.0	**Guyana**	1,340	1,424	1.3
Brazil	8,665	9,876	9.1	**Indonesia**	862	1,164	1.1
India	4,492	4,853	4.4	**Turkey**	550	784	0.7
ex USSR	4,600	4,200	3.8	**United States**	670	495	0.5
China	2,055	3,655	3.3	**France**	550	490	0.4

MANGANESE (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	9,755	8,940	100.00	**Ghana**	160	98	1.10
ex USSR	2,740	2,561	28.65	**Morocco**	16	25	0.28
South Africa	2,017	1,836	20.54	**Hungary**	25	23	0.26
Gabon	1,197	1,200	13.42	**Bulgaria**	11	13	0.14
Brazil	1,143	–	–	**Chile**	14	12	0.14
Australia	1,008	915	10.23	*ex Yugoslavia*	14	–	–
China	640	640	7.16	**Thailand**	5	8	0.09
India	534	503	5.62	**Indonesia**	5	5	0.06
Mexico	150	157	1.76	**Greece**	3	2	0.02

CHROMIUM (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 199
World Total	4,019	3,858	100.0	**Finland**	146	121	3.1
South Africa	1,558	1,416	36.7	**Madagascar**	47	35	0.9
ex USSR	1,090	1,090	28.3	**Iran**	29	28	0.7
India	306	300	7.8	**Philippines**	27	26	0.7
Zimbabwe	206	270	7.0	**Greece**	24	25	0.6
Turkey	230	220	5.7	**Cuba**	12	11	0.3
Albania	175	170	4.4	**Pakistan**	4	6	0.2
Brazil	129	124	3.2	**Sudan**	9	5	0.1

MOLYBDENUM (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	116,408	108,383	100.0	**Mexico**	4,189	4,000	3.7
United States	63,105	61,611	56.8	**Peru**	5,000	2,000	1.8
Chile	16,550	13,830	12.8	**China**	2,000	2,000	1.8
Canada	13,543	13,481	12.4	**Bulgaria**	190	180	0.2
ex USSR	11,500	11,000	10.1	**Korea, South**	220	171	0.2

TUNGSTEN (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	31,451	31,833	100.0	**Peru**	1,228	1,372	4.3
China	9,000	11,000	34.6	**Korea, South**	1,828	1,266	4.0
ex USSR	9,300	8,000	25.1	**Austria**	1,245	1,250	3.9
Portugal	1,381	1,405	4.4				

(continues)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 19
Bolivia	1,118	1,200	3.8	Japan	296	254	0.8
Korea, North	500	1,000	3.1	Turkey	150	100	0.3
Australia	1,211	691	2.2	Rwanda	105	100	0.3
Brazil	538	422	1.3	Spain	81	80	0.3
Myanmar (Burma)	186	300	0.9	Great Britain (UK)	50	50	0.2
Thailand	560	269	0.8	Argentina	20	30	0.1

NICKEL (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 19
World Total	869,049	858,468	100.0	Dominican Rep.	31,300	28,700	3.3
ex USSR	210,000	212,000	24.7	Brazil	20,963	23,000	2.7
Canada	195,554	191,145	22.3	Botswana	21,309	19,022	2.2
New Caledonia	80,300	85,100	9.9	Greece	18,900	18,500	2.2
Australia	66,000	69,000	8.0	Philippines	15,376	15,820	1.8
Indonesia	59,600	53,800	6.3	Zimbabwe	11,633	11,442	1.3
Cuba	46,592	38,400	4.5	Finland	9,958	9,986	1.2
South Africa	35,470	36,300	4.2	Albania	8,800	8,500	1.0
China	34,288	33,204	3.9	Norway	1,300	3,100	0.4

MERCURY (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 19
World Total	5,965	5,983	100.0	United States	414	460	7.7
ex USSR	2,300	2,100	35.1	Mexico	345	345	5.8
Spain	967	1,500	25.1	Turkey	197	130	2.2
China	700	700	11.7	*ex Czechoslovakia*	131	126	2.1
Algeria	587	637	10.6	*ex Yugoslavia*	51	70	1.2

MAGNESITE (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 19
World Total	14,497	14,403	100.0	*ex USSR*	1,825	1,825	12.7
ex Czechoslovakia	2,903	2,920	20.3	Austria	1,122	1,205	8.4
China	2,000	2,000	13.9	Turkey	1,126	1,200	8.3
Korea, North	1,900	1,900	13.2	Greece	930	900	6.2

Prized Metals and Precious Stones

GOLD (in lb)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	3,910,265	4,221,908	100.0	Papua New Guinea	83,886	60,584	1.4
South Africa	1,359,048	1,323,353	31.3	Colombia	63,844	59,598	1.4
ex USSR	616,000	627,000	14.9	Chile	45,351	49,630	1.2
United States	442,011	584,190	13.8	Zimbabwe	32,503	35,207	0.8
Australia	334,407	447,839	10.6	Korea, South	24,466	31,394	0.7
Canada	287,071	350,887	8.3	Ghana	25,588	29,183	0.7
China	171,600	198,000	4.7	Ecuador	20,871	28,600	0.7
Brazil	124,183	–	–	Peru	20,161	22,781	0.5
Philippines	78,100	77,660	1.8				

(continues)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
Mexico	20,016	18,949	0.4	**Korea, North**	11,000	11,000	0.3
Spain	12,256	18,040	0.4	**New Zealand**	5,289	10,919	0.3
Indonesia	9,990	13,530	0.3	***ex Yugoslavia***	10,164	9,568	0.2
Japan	16,078	13,413	0.3	**Fiji**	9,403	9,286	0.2
Dominican Republic	12,833	11,524	0.3	**Venezuela**	10,274	8,492	0.2
Sweden	9,240	11,264	0.3	**France**	5,837	7,267	0.2

SILVER (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	14,391	14,692	100.0	**South Africa**	180	161	1.1
Mexico	2,306	2,346	16.0	**Japan**	156	150	1.0
United States	2,007	2,168	14.8	**Papua New Guinea**	92	130	0.9
Peru	1,748	1,725	11.7	**China**	125	125	0.9
ex USSR	1,500	1,400	9.5	***ex Yugoslavia***	133	105	0.7
Canada	1,312	1,381	9.4	**Italy**	96	98	0.7
Australia	1,075	1,273	8.7	**Namibia**	108	90	0.6
Poland	1,003	832	5.7	**Zaire**	60	84	0.6
Chile	545	655	4.5	**Argentina**	83	80	0.5
Bolivia	267	280	1.9	**Indonesia**	74	67	0.5
Spain	251	270	1.8	**Greece**	61	63	0.4
Korea, South	239	238	1.6	**Brazil**	60	60	0.4
Sweden	228	220	1.5	**Bulgaria**	59	54	0.4
Morocco	237	190	1.3	**Korea, North**	50	50	0.3

DIAMONDS (in thousands of carats)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	58,031	58,857	100.0	**Ghana**	660	620	1.1
Zaire	18,727	19,000	32.3	**Brazil**	533	550	0.9
Botswana	15,229	15,252	25.9	**Central Afr. Rep.**	343	340	0.6
ex USSR	11,000	11,000	18.7	**Venezuela**	183	219	0.4
South Africa	8,505	9,116	15.5	**Sierra Leone**	175	175	0.3
Angola	1,000	1,000	1.7	**Liberia**	330	168	0.3
Namibia	938	1,000	1.7	**Tanzania**	150	150	0.3

Table 9 – Economic production: Industry
Metallurgy Products

CAST IRON AND FERROALLOYS (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	534,032	547,297	100.0	**Great Britain (UK)**	12,943	12,551	2.3
ex USSR	114,558	113,928	20.8	**India**	11,602	11,930	2.2
Japan	78,398	79,177	14.5	**Italy**	10,986	11,376	2.1
China	57,040	58,200	10.6	**Canada**	9,490	10,200	1.9
United States	50,571	50,687	9.3	***ex Czechoslovakia***	9,338	9,539	1.7
Germany (*ex GFR*)	31,114	31,327	5.7	**Belgium**	9,147	8,863	1.6
Brazil	23,454	24,363	4.5	**Romania**	8,210	8,439	1.5
Turkey	12,541	18,587	3.4	**Poland**	9,032	8,319	1.5
Korea, South	12,492	14,813	2.7	**South Africa**	6,250	6,000	1.1
France	13,704	13,872	2.5				

(continued)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
Australia	5,455	5,875	1.1	**Austria**	3,665	3,823	0.7
Spain	4,617	5,464	1.0	***ex Yugoslavia***	2,787	2,761	0.5
Netherlands	4,994	5,163	0.9	**Luxembourg**	2,520	2,684	0.5
Mexico	5,050	5,050	0.9	**Sweden**	2,492	2,586	0.5

STEEL (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 19
World Total	783,300	766,800	100.0	**Spain**	12,765	12,974	1.7
ex USSR	160,096	154,000	20.1	**Canada**	15,332	12,184	1.6
Japan	107,908	110,339	14.4	**Belgium**	10,954	11,414	1.5
United States	88,432	89,726	11.7	**Romania**	14,415	9,761	1.3
China	61,320	66,450	8.7	**Turkey**	7,902	9,443	1.2
Germany	48,902	43,621	5.7	**South Africa**	9,436	8,743	1.1
Italy	25,213	25,513	3.3	**Mexico**	7,851	8,662	1.1
Korea, South	21,873	23,586	3.1	**Korea, North**	9,630	8,000	1.0
Brazil	25,055	20,572	2.7	**Australia**	6,865	6,651	0.9
France	19,335	19,016	2.5	**Netherlands**	5,681	5,412	0.7
Great Britain (UK)	18,740	17,610	2.3	**Sweden**	4,692	4,455	0.6
ex Czechoslovakia	15,465	14,877	1.9	**Austria**	4,718	4,291	0.6
India	12,540	14,747	1.9	**Argentina**	3,909	3,610	0.5
Poland	15,094	13,633	1.8	***ex Yugoslavia***	4,448	3,608	0.5

COPPER FOUNDRY PRODUCTS (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 19
World Total	8,859	8,631	100.0	**Australia**	203	192	2 2
Chile	1,267	1,329	15 4	**Korea, South**	160	186	2.2
United States	1,120	1,159	13.4	**Germany (*ex GFR*)**	177	184	2.1
ex USSR	1,075	990	11.5	**South Africa**	185	176	2.0
Japan	882	893	10.3	**Mexico**	174	174	2.0
Canada	462	481	5.6	**Philippines**	156	154	1.8
Zambia	485	461	5.3	**Brazil**	153	148	1.7
China	430	425	4.9	**Spain**	120	120	1 4
Poland	381	342	4.0	***ex Yugoslavia***	102	106	1.2
Zaire	425	338	3.9	**Sweden**	70	84	1.0
Peru	309	261	3.0	**Iran**	61	55	0 6

ZINC FOUNDRY PRODUCTS (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 199
World Total	7,254	7,097	100.0	**Korea, South**	240	248	3.5
ex USSR	1,020	920	13.0	**Italy**	246	248	3.5
Japan	665	688	9.7	**Korea, North**	259	239	3.4
Canada	670	592	8.3	**Netherlands**	203	208	2.9
China	451	526	7.4	**Mexico**	195	199	2.8
United States	358	366	5.2	**Finland**	168	175	2.5
Germany (*ex GFR*)	354	338	4.8	**Brazil**	162	154	2.2
Australia	294	301	4.2	**Poland**	164	132	1.9
Belgium	287	290	4.1	**Norway**	121	125	1.8
France	266	264	3.7	**Peru**	138	118	1.7
Spain	246	253	3.6	***ex Yugoslavia***	119	114	1.6

TIN FOUNDRY PRODUCTS (in metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	230,000	225,600	100.0	*ex USSR*	15,000	14,000	6.2
Malaysia	51,900	49,000	21.7	Bolivia	9,700	13,400	5.9
Brazil	44,200	35,100	15.6	Great Britain (UK) (*)	10,800	12,000	5.3
Indonesia	30,200	30,400	13.5	Netherlands (*)	4,700	6,300	2.8
China	28,300	28,000	12.4	Mexico	4,400	5,000	2.2
Thailand	14,600	15,500	6.9				

(*) Including secondary tin smelting

LEAD FOUNDRY PRODUCTS (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	3,241	3,043	100.0	Canada	157	100	3.3
ex USSR	520	500	16.4	Korea, North	90	80	2.6
United States	397	404	13.3	Belgium-Luxembourg	70	70	2.3
China	269	266	8.7	Peru	74	69	2.3
Australia	189	207	6.8	Italy	77	69	2.3
Japan	208	205	6.7	Morocco	64	65	2.1
Germany (*ex GFR*)	170	162	5.3	*ex Yugoslavia*	71	58	1.9
Great Britain (UK)	157	156	5.1	Spain	61	57	1.9
France	149	137	4.5	Bulgaria	70	48	1.6
Mexico	174	100	3.3	Sweden	35	35	1.2

ALUMINUM (in thousands of metric tons)

	1989 Prod.	1990 Prod.	% 1990		1989 Prod.	1990 Prod.	% 1990
World Total	18,215	18,024	100.0	Spain	326	355	2.0
United States	4,030	4,048	22.5	*ex Yugoslavia*	342	351	1.9
ex USSR	2,500	2,200	12.2	France	335	326	1.8
Canada	1,555	1,567	8.7	Great Britain (UK)	297	290	1.6
Australia	1,242	1,233	6.8	Netherlands	277	272	1.5
Brazil	888	931	5.2	New Zealand	259	260	1.4
Norway	859	871	4.8	Italy	220	232	1.3
China	750	850	4.7	Bahrain	187	213	1.2
Germany (*ex GFR*)	742	720	4.0	Indonesia	197	192	1.1
Venezuela	546	594	3.3	Egypt	180	180	1.0
India	423	433	2.4	Ghana	169	174	1.0

Fertilizers and Chemicals

NATURAL PHOSPHATES (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	161,479	158,986	100.0	Senegal	2,322	2,270	1.4
United States	45,389	43,866	27.6	Syria	2,186	2,250	1.4
ex USSR	38,820	–	–	Nauru	1,540	–	–
China	18,237	19,827	12.5	Egypt	1,330	1,347	0.8
Morocco	20,078	18,687	11.8	Algeria	1,332	1,320	0.8
Jordan	5,628	6,642	4.2	India	725	708	0.4
Tunisia	6,027	6,610	4.2	Mexico	667	650	0.4
Brazil	4,672	3,655	2.3	Turkey	616	–	–
Togo	3,484	3,350	2.1	Finland	583	564	0.4
South Africa	2,850	2,963	1.9	Vietnam	600	500	0.3
Israel	2,648	2,762	1.7	Korea, North	500	500	0.3

NITROGEN FERTILIZERS (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 19
World Total	90,437	92,262	100.0	**Indonesia**	1,979	2,033	2.2
ex USSR	15,815	15,604	16.9	**France**	2,029	1,929	2.1
China	13,656	14,241	15.4	**Netherlands**	1,757	1,800	2.0
United States	12,162	12,691	13.8	**Poland**	1,622	1,643	1.8
India	6,480	6,725	7.3	**Mexico**	1,346	1,360	1.5
Egypt	4,387	4,539	4.9	**Japan**	1,395	1,338	1.5
Canada	2,762	3,000	3.3	**Italy**	1,279	1,297	1.4
Germany	2,335	2,224	2.4	**Pakistan**	1,097	1,112	1.2
Romania	2,130	2,035	2.2	**Great Britain (UK)**	1,105	1,100	1.2

POTASSIUM SALTS (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		8 Prod.	1989 Prod.	% 19
World Total	29,600	27,254	100.0	**United States**	1,521	1,595	5.9
ex USSR	11,301	10,500	38.5	**Jordan**	1,310	1,315	4.8
Canada	8,190	7,014	25.7	**France**	1,612	1,291	4.7
Germany (*ex GFR*)	2,869	2,752	10.1	**Israel**	1,244	1,271	4.7

SULFURIC ACID (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 19
World Total	142,756	142,280	100.0	**Spain**	3,440	3,312	2.3
United States	38,229	39,282	27.6	**India**	3,416	3,293	2.3
ex USSR	29,372	28,276	19.9	**Poland**	3,154	3,115	2.2
China	11,113	11,533	8.1	**Italy**	2,499	2,053	1.4
Japan	6,767	6,885	4.8	**Great Britain (UK)**	2,257	1,977	1.4
Germany (*ex GFR*)	4,053	4,863	3.4	**Australia**	1,818	1,904	1.3
France	4,081	4,187	2.9	**Belgium**	2,136	1,898	1.3
Brazil	4,049	3,809	2.7	**Romania**	1,825	1,687	1.2
Canada	3,805	3,560	2.5	***ex Yugoslavia***	1,713	1,617	1.1

HYDROCHLORIC ACID (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 19
World Total	10,902	11,019	100.0	**South Africa**	138	190	1.7
United States	2,928	2,882	26.2	**Spain**	174	180	1.6
China	2,462	2,579	23.4	**Canada**	180	180	1.6
Germany	1,114	1,100	10.0	**Great Britain (UK)**	176	167	1.5
Japan	735	762	6.9	***ex Yugoslavia***	134	149	1.3
France	702	694	6.3	**Thailand**	119	113	1.0
Romania	473	453	4.1	**Netherlands**	82	80	0.7
Belgium	411	360	3.3	***ex Czechoslovakia***	79	76	0.7

NITRIC ACID (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	28,133	28,350	100.0	**Belgium**	1,343	1,329	4.7
United States	7,249	7,574	26.7	**Spain**	1,229	1,249	4.4
Germany	3,838	3,688	13.0	**Italy**	1,193	1,108	3.9
Poland	2,187	2,175	7.7				

(continued)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
Canada	919	1,027	3.6	Japan	618	658	2.3
Hungary	970	884	3.1	Finland	544	518	1.8
ex Yugoslavia	858	730	2.6	Brazil	387	430	1.5

CAUSTIC SODA (in thousands of metric tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 1989
World Total	35,456	35,346	100.0	Canada	1,720	1,679	4.8
United States	9,556	9,518	26.9	France	1,494	1,531	4.3
Japan	3,403	3,564	10.1	Italy	1,190	1,178	3.3
Germany (*ex GFR*)	3,664	3,541	10.0	Brazil	1,007	991	2.8
China	3,005	3,211	9.1	India	907	910	2.6
ex USSR	3,323	3,185	9.0	Romania	821	763	2.2

ARTIFICIAL CELLULOSE FIBERS (in millions of square feet)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	% 19
World Total	87,113	86,962	100.0	Poland	753	635	0.7
France	17,657	18,561	21.3	*ex Czechoslovakia*	635	613	0.7
Japan	7,188	7,478	8.6	Great Britain (UK)	495	–	–
Germany (*ex GFR*)	5,369	5,735	6.6	*ex Yugoslavia*	323	409	0.5
Belgium	2,884	–	–	Hungary	377	323	0.4

Table 10 — Economic production: Energy resources and transportation
Energy

ELECTRICITY

	Installed capacity ('000 kW, 1989)	Energy produced in 1989 (mill. kWh)	Energy produced in 1990 (mill. kWh)	1990
World Total		11,444,552	11,720,904	100.0
United States	757,593	2,982,478	3,028,055	25.8
ex USSR	333,100	1,722,000	1,726,000	14.7
Japan	185,133	798,756	857,273	7.3
China	98,000	582,000	618,000	5.3
Germany	121,868	555,977	572,002	4.9
Canada	98,890	499,510	481,765	4.1
France	100,140	406,333	419,584	3.6
Great Britain (UK)	69,879	313,863	318,977	2.7
India	69,873	266,196	286,029	2.4
Brazil	52,071	221,738	222,195	1.9
Italy	62,063	207,450	216,891	1.9
South Africa	25,870	162,320	162,340	1.4
Australia	36,782	147,788	154,571	1.3
Spain	43,791	146,590	150,622	1.3
Sweden	32,783	143,902	146,530	1.3
Poland	30,750	145,467	136,337	1.2
Mexico	27,338	118,083	122,449	1.0

	Installed capacity ('000 kW, 1989)	Energy produced in 1989 (mill. kWh)	Energy produced in 1990 (mill. kWh)	% 1990
Norway	26,715	118,775	121,601	1.0
Korea, South	23,522	102,906	118,738	1.0
ex Czechoslovakia	17,392	87,534	89,345	0.8
ex Yugoslavia	16,470	86,309	85,905	0.7
Taiwan	16,969	76,912	–	–
Netherlands	17,291	73,027	71,816	0.6
Belgium	14,072	66,862	70,207	0.6
Romania	22,904	75,850	64,306	0.5
Turkey	15,806	52,043	57,544	0.5
Iran	15,504	42,310	56,000	0.5
Switzerland	15,320	53,766	55,846	0.5
Venezuela	17,733	59,328	55,750	0.5
Finland	12,706	53,881	54,508	0.5
Korea, North	9,500	53,500	53,500	0.5
Argentina	16,600	50,832	50,907	0.4
Austria	16,807	50,167	50,414	0.4
Saudi Arabia	17,150	46,300	47,400	0.4
Thailand	7,872	39,106	46,175	0.4

(continues)

	Installed capacity ('000 kW, 1989)	Energy produced in 1989 (mill. kWh)	Energy produced in 1990 (mill. kWh)	% 1990		Installed capacity ('000 kW, 1989)	Energy produced in 1989 (mill. kWh)	Energy produced in 1990 (mill. kWh)	% 1990
Indonesia	11,030	41,810	44,260	0.4	**Egypt**	11,845	39,300	39,550	0.3
Pakistan	8,467	40,284	43,899	0.4	**Greece**	8,346	34,456	35,002	0.3
Bulgaria	11,103	44,330	41,300	0.4	**New Zealand**	6,964	29,471	30,158	0.3

NUCLEAR POWER

	Installed power ('000 kW, 1989)	Energy produced (mill. kWh, 1989)		Installed power ('000 kW, 1989)	Energy produced (mill. kWh, 1989)
United States	103,397	529,355	**Spain**	7,469	56,124
France	52,530	303,931	**Korea, South**	7,616	47,365
ex USSR	37,400	213,000	**Belgium**	5,500	41,217
Japan	29,445	182,869	***ex Czechoslovakia***	3,226	24,575
Germany	24,628	161,287	**Switzerland**	2,950	22,836
Canada	11,890	79,871	**Finland**	2,350	19,091
Sweden	9,850	65,885	**India**	1,565	7,349
Great Britain (UK)	7,665	64,600	**Argentina**	1,018	5,550

Transportation

SHIPYARDS – SHIPS LAUNCHED (in thousands of gross register tons)

	1988 Prod.	1989 Prod.	% 1989		1988 Prod.	1989 Prod.	1989
World Total	11,997	13,041	100.00	**China**	287	225	1 73
Japan	4,546	6,023	46 19	**Italy**	334	212	1.63
Korea, South	3,406	2,679	20.54	**Finland**	274	208	1.59
Germany	809	765	5.87	**Poland**	179	122	0.94
Taiwan	484	580	4.45	**Netherlands**	68	108	0 83
ex Yugoslavia	330	479	3.67	**Great Britain (UK)**	91	100	0.77
Denmark	315	314	2.41	**France**	100	77	0.59
Spain	141	276	2.12	**Belgium**	28	45	0.35
Brazil	269	260	1.99	**Norway**	32	31	0.24

MERCHANT MARINE (motor vessels over 100 gross register tons, in thousands of gross register tons, 1990)

	No. of ships	Gross tonnage	% GT		No. of ships	Gross tonnage	% GT
World Total	78,336	423,627	100.0	**Great Britain (UK)**	1,998	6,716	1.6
Liberia	1,688	54,700	12.9	**Hong Kong**	375	6,565	1.5
Panama	4,748	39,298	9.3	**India**	855	6,476	1.5
Japan	10,000	27,078	6.4	**Brazil**	691	6,016	1.4
ex USSR	7,383	26,737	6.3	**Taiwan**	660	5,766	1.4
Norway	2,557	23,423	5.5	**Denmark**	1,260	5,188	1.2
United States	6,348	21,328	5.0	**Iran**	393	4,738	1.1
Greece	1,814	20,522	4.8	**Malta**	524	4,519	1.1
Cyprus	1,270	18,336	4.3	**Germany (*ex GFR*)**	1,179	4,301	1.0
China	1,948	13,899	3.3	**Bermuda**	105	4,258	1.0
Bahamas	807	13,626	3.2	**Romania**	483	4,005	0.9
Philippines	1,420	8,515	2.0	**France**	900	3,832	0.9
Singapore	774	7,928	1.9	***ex Yugoslavia***	501	3,816	0.9
Korea, South	2,110	7,783	1.8	**Spain**	2,338	3,807	0.9
Italy	1,616	7,399	1.7				

(continued)

	No. of ships	Gross tonnage	% GT		No. of ships	Gross tonnage	% GT
Netherlands	1,227	3,785	0.9	**Poland**	698	3,369	0.8
Turkey	869	3,719	0.9	**Sweden**	679	2,775	0.7

MOTOR VEHICLE PRODUCTION (1990 – ANFIA[1])

	Cars	Industrial Vehicles	Total	%		Cars	Industrial Vehicles	Total	%
World Total	35,877,578	11,923,259	47,800,837	100.0	***ex USSR***	1,125,000	760,800	1,885,800	3.9
Japan	9,947,972	3,538,824	13,486,796	28.2	**Great Britain (UK)**	1,295,611	270,133	1,565,744	3.3
United States	6,077,885	3,702,762	9,780,647	20.5	**Korea, South**	986,751	334,879	1,321,630	2.8
Germany (*ex GFR*)	4,813,194	350,248	5,163,442	10.8	**Brazil**	663,097	251,587	914,684	1.9
France	3,294,815	474,178	3,768,993	7.9	**Mexico**	598,093	222,465	820,558	1.7
Italy	1,874,672	246,178	2,120,850	4.4	**Sweden**	322,241	74,415	396,656	0.8
Spain	1,679,301	374,049	2,053,350	4.3	**Australia**	360,912	23,179	384,091	0.8
Canada	1,076,119	850,304	1,926,423	4.0					

MOTOR VEHICLES IN CIRCULATION (1989 fleet – ANFIA[1])

	Thousands	Persons per vehicle		Thousands	Persons per vehicle
World Total	561,490	9.0	**Saudi Arabia (*)**	2,855	5.6
United States	188,669	1.3	**Argentina (*)**	5,680	5.6
Canada (*)	15,400	1.7	**Poland**	5,914	6.5
Australia	9,489	1.7	**Bulgaria (*)**	1,284	7.0
New Zealand (*)	1,865	1.8	***ex Yugoslavia* (*)**	3,395	7.0
Germany (*ex GFR*)	32,348	1.9	**Venezuela (*)**	2,174	8.9
France	27,758	2.0	**South Africa (*)**	4,241	9.1
Italy	28,729	2.0	**Taiwan (*)**	2,103	9.6
Japan	62,093	2.0	**Malaysia (*)**	1,523	11.0
Switzerland	3,178	2.1	**Mexico (*)**	7,795	11.1
Norway	1,930	2.2	**Brazil**	12,923	11.4
Sweden	3,886	2.2	***ex USSR* (*)**	22,075	13.1
Great Britain (UK)	25,574	2.2	**Korea, South**	2,660	15.9
Finland	2,034	2.4	**Algeria (*)**	1,205	20.7
Austria	3,199	2.4	**Thailand (*)**	2,239	24.8
Belgium	4,119	2.4	**Colombia (*)**	1,262	25.3
Netherlands	5,928	2.5	**Iran (*)**	2,108	25.6
Denmark	1,902	2.7	**Turkey (*)**	1,954	28.3
Spain	13,737	2.9	**Morocco (*)**	792	32.3
Germany (*ex GDR*)	4,369	3.8	**Nigeria (*)**	1,379	83.6
***ex Czechoslovakia* (*)**	3,461	4.5	**Indonesia (*)**	2,099	89.4
Hungary	2,07[illegible]	5.1	**China (*)**	4,325	257.2
Portugal	1,908	5.1	**India (*)**	3,109	268.1
Libya (*)	770	5.3			

[1] Italian National Association of Automobile Industries

(*) = 1988

MAJOR INTERNATIONAL PORTS (in thousands of metric tons of cargo)

	Cargo loaded	Cargo unloaded	Total	Year
Rotterdam (Netherlands)	66,415	225,456	291,871	1989
New Orleans (United States)	–	–	175,501	1990
Singapore (Singapore)	75,931	97,367	173,298	1989
Kobe (Japan)	79,854	86,880	166,734	1988
Chiba (Japan)	42,896	121,286	164,182	1989
New York (United States)	–	–	155,062	1990
Shanghai (China)	33,186	79,719	112,905	1985

(continued)

	Cargo loaded	Cargo unloaded	Total	Year
Nagoya (Japan)	41,572	68,025	109,597	1987
Antwerp (Belgium)	38,474	56,926	95,400	1989
Marseille (France)	17,746	75,673	93,419	1989
Kawasaki (Japan)	30,961	60,643	91,604	1979
Vitoria (Brazil)	77,027	11,406	88,433	1989
Osaka (Japan)	31,732	54,411	86,143	1985
Hong Kong (Hong Kong)	30,126	55,269	85,395	1989
Kaohsiung (Taiwan)	14,270	63,877	78,147	1989
Philadelphia (United States)	5,524	66,233	71,757	1989
Corpus Christi (United States)	30,414	38,963	69,377	1989
Yokohama (Japan)	26,447	37,902	64,349	1989
Vancouver (Canada)	57,674	6,351	64,025	1989
Houston (United States)	22,782	39,843	62,625	1989
Los Angeles (United States)	19,641	42,852	62,493	1989
Tokyo (Japan)	17,667	44,208	61,875	1979
Hamburg (Germany)	20,952	36,630	57,582	1989
Richard's Bay (South Africa)	54,088	1,491	55,579	1989
London (Great Britain)	12,051	41,983	54,034	1989
Tampa (United States)	24,803	28,409	53,212	1989
Le Havre (France)	12,084	40,155	52,239	1989
Genoa (Italy)	4,215	38,322	42,537	1988
Teeside-Hartlepool (Great Britain)	23,249	16,043	39,292	1989
Dunkirk (France)	10,568	28,573	39,141	1989
Grimsby (Great Britain)	11,126	25,705	36,831	1989
Warri (Nigeria)	1,071	35,118	36,189	1989
Sydney (Australia)	14,683	21,390	36,073	1986
Newcastle (Australia)	29,800	5,500	35,300	1989
Milford Haven (Great Britain)	13,578	19,558	33,136	1989
Bremen (Germany)	12,683	19,774	32,457	1989
as-Sidrah (Libya)	31,730	0	31,730	1979
Baltimore (United States)	14,182	16,801	30,983	1989
Augusta (Italy)	13,448	17,147	30,595	1988
Manila (Philippines)	10,088	20,320	30,408	1989
Taranto (Italy)	7,995	21,725	29,720	1988
Santos (Brazil)	19,123	10,480	29,603	1989
Amsterdam (Netherlands)	8,802	19,906	28,708	1989
Bombay (India)	14,605	13,146	27,751	1989
Bilboa (Spain)	8,328	18,638	26,966	1989
Durban (South Africa)	16,366	8,850	25,216	1989
Venice (Italy)	3,865	21,024	24,889	1988
Göteborg (Sweden)	11,021	13,274	24,295	1989
Pointe-Noire (Congo)	21,722	1,580	23,302	1989
Trieste (Italy)	3,239	20,052	23,291	1988
Ghent (Belgium)	5,443	17,604	23,047	1989
Arzew (Algeria)	22,467	441	22,908	1982
Porto Foxi (Italy)	9,635	12,292	21,927	1988
Alexandria (Egypt)	–	–	21,400	1987
Rouen (France)	12,543	8,387	20,930	1989
Rostock (Germany)	7,940	12,835	20,775	1989
Montreal (Canada)	6,683	13,740	20,423	1989
Sines (Portugal)	8,169	11,755	19,924	1989
Szczecin (Poland)	–	–	19,348	1989
Danzig (Poland)	–	–	18,859	1989
Barcelona (Spain)	6,248	11,896	18,144	1989
Casablanca (Morocco)	9,046	5,962	15,008	1989
Salonika (Greece)	5,288	9,268	14,556	1989
Lisbon (Portugal)	2,193	11,855	14,048	1989

LEXICON

ALLOCHTHONOUS – Relating to a physical or anthropic element that originated in a system different from the space or social context in which it lives.
ALLUVIAL DEPOSITS – Loose materials (gravel, sand, silt) deposited by a river or stream when it overflows as a result of excessive and prolonged precipitation.
AQUIFER – Accumulation of subsurface water trapped in porous rocky strata (gravel, sand, sandstone, etc.); the water table can lie unconfined when its upper surface is open to the atmosphere (groundwater aquifer), be compressed between two impervious rocky layers (confined aquifer) or more or less completely occupy underground cavities within limestone (karst aquifer).
ARCHIPELAGO – Group of islands emerging to the surface from a submarine ridge or shelf and characterized by very close proximity.
AUTOCHTHONOUS – Relating to physical or anthropic elements that originated in the same space or social context in which they are present.
BALANCE OF PAYMENTS – National accounting records reflecting the difference between a nation's total payments and receipts, including the value of all goods and services.
BALANCE OF TRADE – The difference in value between a nation's exports and imports of goods, services, and capital over a specified period; it is said to be favorable or unfavorable as exports exceed or are less than imports.
BASEMENT – A complex, usually of igneous and metamorphic rocks, that is overlain unconformably by sedimentary strata; also, a crustal layer beneath a sedimentary one and above the Mohorovičić discontinuity.
BOREAL – Relating to locations and situations in the Northern Hemisphere between the equator and the North Pole.
BOREAL FOREST – See taiga.
CAATINGA – Tropical plant formation similar to savanna found in northeastern Brazil, with undergrowth thickets of shrubs, grass, and tree species such as mimosa and cactus.
CALDERA – Large bowl-shaped volcanic depression resulting from the collapse or subsidence of the center of a volcanic cone.
CALORIE – Quantity of heat required at a pressure of 1 atmosphere to raise the temperature of 1 gram of water 1 degree centigrade; also called a gram calorie or small calorie. A food calorie, or large calorie, is actually a kilocalorie, equivalent to 1000 normal calories.
CANYON – Deep river valley with almost vertical or precipitous cliffs.
CAPE – Extension of land jutting out into the sea; a headland or promontory.
CASCADE – A small waterfall or series of falls descending over rocks.
CATARACT – A waterfall of considerable volume with the vertical fall concentrated in one sheer drop.
CATCHMENT AREA – See hydrographic basin.
CENSUS – Periodic statistical enumeration, usually carried out every ten years, of an area's population and its dynamic and structural characteristics; censuses are also undertaken to assess economic data.
CHERNOZEM – Dark-colored zonal soil (literally, "black earth" in Russia) that develops in a temperate steppe environment and is very rich in humus, making it especially suitable for the cultivation of grains.
CHLOROFLUOROCARBONS (CFCs) – Gases used as refrigerants, propellants, or solvents held responsible for depletion of the atmosphere's ozone layer, which shields living organisms from harmful ultraviolet radiation.
CHOTT – Shallow lake basin or marsh frequently found in arid or subdesert areas of northern Africa; intense evaporation causes its level to vary considerably, promoting the formation of saline deposits; very similar to sebkha (*q.v.*).
CLIMATIC REGIMEN – Behavior of the climatic elements (temperature, precipitation, wind, etc.) in the course of the year which determine a type of climate (e.g., monsoon, Mediterranean, etc.).

COLONY – Territory which is administered by a foreign country that has free access to its resources and whose population is deprived of the right to self-government.
CONTIGUOUS ZONE – A geographically limited ocean zone 12 nautical miles wide, adjacent to the territorial waters of a coastal state and subject to its customs, fiscal, sanitary, and other jurisdiction.
CONTINENTAL SHELF – Margin (in some cases quite wide) around a continental landmass that has submerged from the sea or ocean, gently sloping from the shoreline to the continental slope and extending to some depth but rarely beyond 100 fathoms [200 m]. In international law, the continental shelf lies within the sovereignty of the coastal nation to which it is contiguous and which has the right to exploit its resources (see Exclusive Economic Zone).
CONTINENTAL SLOPE – Seaward border of the submerged continental shelf (*q.v.*) consisting of a steep incline which drops down to the level of the ocean floor.
CONURBATION – Merger in a single urban agglomeration of several inhabited centers as a result of their gradual expansion.
CORAL REEF – Formation of coral colonies in tropical seas off the coast that have emerged directly from the submarine shelf or from submerged reliefs; often separated from the shore by a lagoon (*q.v.*).
CORDILLERA – Group of mountain ranges forming a mountain system of great linear extent and often consisting of a number of more or less parallel chains, primarily used in North and South American toponomy.
CRATER – In geology, a bowl-shaped cavity located at the summit of a volcano, generally in direct communication with a volcanic vent or channel through which magmatic materials (lava, gas) emerge.
CREOLE – A native of the West Indies or Latin America of European (usually Spanish or French) ancestry; also, a pidgin language derived from English, Spanish, or Portuguese enriched by elements from Africa and Latin America.
DELTA – Low-lying alluvial sediments at the mouth of a river, consisting of sand, clay, and mud banks separated by a network of natural channels.
DEPRESSION – Relatively hollow or sunken land area surrounded by higher elevations.
DUNE – Accumulation of sand built up by the wind, commonly found along shores, near lakes, or in desert regions.
ECONOMICALLY ACTIVE POPULATION – Those inhabitants of a given political and administrative unit which officially constitute its labor force, subdivided in turn into the three principal economic sectors: primary (agriculture, forestry, mining, etc.), secondary (manufacturing, construction, etc.), and tertiary (commerce, services, etc.).
ECOSYSTEM – Ecological community in which living organisms coexist and interact with the physical environmental factors in a given area.
ECUMENE – Permanently inhabited portion of the Earth as distinguished from the uninhabited or temporarily inhabited areas.
ENCLAVE – A country, or especially an outlying portion of a country, entirely or mostly surrounded by the territory of another country, or a cultural or linguistic minority group surrounded by a dominant majority group. See exclave.
ENDOGENOUS – Relating to situations and phenomena occurring or originating inside the Earth's crust or within a biological system.
ENDORHEIC – Flowing to the inside, applied particularly to inland drainage basins whose water does not reach the sea.
ENVIRONMENT – Complex of physical, chemical, and biological factors affecting various areas of the Earth's surface, characterized by the interdependence of coexisting phenomena and organisms.
EPIPHYTE – A plant which grows nonparasitically on another plant or on some nonliving structure, such as a building or telephone pole, deriving moisture and nutrients from the air. Also known as aerophyte or air plant.
EQUATOR – Imaginary circle around the Earth whose plane (equatorial plane) is perpendicular to the Earth's axis of rotation and equidistant from its poles, dividing the Earth's surface into the Northern and Southern Hemispheres.
EROSION – The wearing away of the land, chiefly by rain and running water; also, the loosening and transportation of rock debris at the earth's surface.
ESTUARY – Broad and deep tidal mouth of a river where the river's current meets the tide of the sea.
EXCHANGE – Organized market where movable assets, such as securities, obligations, currency, and money are bought and sold (stock exchange) or commodities, raw materials, air or maritime charters, etc., are traded (commodity exchange). See market.
EXCLAVE – A portion of a country which is separated from the main part and surrounded by alien territory; considered within the latter as an enclave (*q.v.*).
EXCLUSIVE ECONOMIC ZONE – Expanse of ocean extending for 200 nautical miles beyond the limits of a coastal country's territorial waters (*q.v.*) over which it has exploitation rights to all natural resources, including those relating to the continental shelf (*q.v.*) lying underneath.
EXOGENOUS – Relating to situations and phenomena occurring or originating on the Earth's surface or outside a given biological system.
EXORHEIC – Flowing to the outside, applied particularly to normal drainage basins whose water flows to the sea.
FAULT – Fracture of stratified rocky structures of the Earth's crust due to dynamic stress.
FJORD – Narrow, deep glacial inlet formed by entrance of the sea into a deeply excavated glacial trough after the melting of a glacier.
FLOODPLAIN – The relatively smooth valley floors adjacent to and formed by alluviating rivers which are subject to overflow.
FLOW RATE – Time required for a given quantity of fluid to travel a measured distance, as through a cross section of a river or stream; usually measured in cubic feet (or meters) per second.
FOLD – A bend in rock strata or other planar structure, usually produced by deformation; folds are recognized where layered rocks have been distorted into wavelike form.
FOREST (WOODLAND) – Complex ecological system of vegetation comprising predominantly tall trees and often still in its natural state and therefore unmodified by human intervention, which may consist of one or more species (as in the case of temperate or monsoon forests) or of many mixed species

(equatorial forest).

FUMAROLE – Vent in a volcanic structure from which gases and vapors issue at high temperature during its dormant phase.

GEOSYNCLINE – Large, generally linear trough of accumulated sediment in a depression between two landmasses; the rising of a geosyncline and its successive compression as a result of tectonic thrust due to the movement of contiguous crustal plates leads to the folding of the sedimentary deposits and the formation of mountain systems (see orogeny).

GEYSER – Intermittent eruption of underground hot water and steam from an active volcanic area.

GROSS DOMESTIC PRODUCT (GDP) – Total market value of goods and services produced in a country in a specified period of time, usually a year.

GROSS NATIONAL PRODUCT (GNP) – Total market value of goods and services of a nation's economy produced during a specified period of time (but excluding goods or services used in the process of production of further goods and services), i.e., the gross domestic product (*q.v.*) combined with income (*q.v.*) accruing to a nation's residents from investments abroad minus the income earned in the domestic economy accruing to foreign nationals.

GULLY – A narrow valley or ravine originally formed by running water and through which water usually flows only after a period of rain.

HEATH (MOORLAND) – Temperate-climate open and uncultivated land with poor soil, that often has developed as a result of deforestation or inferior drainage, where heather, erica, fescue grass, and other shrubby, acid-tolerant plants predominate.

HINTERLAND – Tributary inland region, either rural or urban, that is closely linked physically, economically, and politically to a nearby port or coastal area.

HYDROGRAPHIC BASIN – Area in which surface runoff collects to feed either a single watercourse which drains directly or indirectly into the sea (exorheic basin) or a lake having no outlet (closed or endorheic basin). Synonym of catchment area (*q.v.*).

HYDROGRAPHIC REGIMEN – Aggregate annual fluctuations in river discharge and flow rate (*q.v.*) due to specific factors (precipitation, size of water basin, etc.).

ICE FIELD – A mass of land ice resting on a mountain region and covering all but the highest peaks; also, a flat sheet of sea ice that is more than 5 mi (8 km) across.

ICEBERG – Floating mass of freshwater ice detached from a polar glacier or ice sheet most typically found in open seas and set adrift at the mercy of winds and swells; the bulk of an iceberg is under water.

INCOME – Total value of the proceeds from productive activities carried out by the citizens of a country within a specified period of time.

INLAND (or INTERNAL) WATERS – Stretches of sea overlooking the coastal belt of the territory of a state (such as bays, gulfs, and any other type of inlet) that do not border upon marginal or high seas, are delimited by a baseline separating them from the territorial waters (*q.v.*), and fall within the total sovereignty of the said state.

ISTHMUS – Relatively narrow strip of land bordered on two sides by water and connecting two larger bodies of land.

KARST – A topography formed over limestone, dolomite or gypsum and characterized by sinkholes, caves, and underground drainage.

LAGOON – Shallow sound, pond, or lake along a coastline, generally separated from the open sea by a low sandbank, barrier beach (*q.v.*) or coral reef; when communicating with the sea, lagoons become coastal lakes whose degree of salinity is reduced by freshwater input.

LAND RECLAMATION – Aggregate of human measures taken to make environmental land conditions suitable for cultivation, settlement, or other economic use by drainage of marsh areas, irrigation of arid land, organization of mountain slopes and catchment basins, reforestation, land reform, and establishment of all infrastructures (roads, settlements, etc.) necessary to make land totally productive (comprehensive land improvement).

LANDMASS – A very large continuous area of the Earth's crust lying above sea level; also, a continent.

LANDSCAPE – All of the directly perceptible and interdependent physical and human elements that coexist in a given area of the Earth's surface whose general physiognomy it delineates.

LANDSLIDE – Downward mass movement of loose earth and rocks, or a mixture of the two with water and mud, sliding down a mountainside or hillside under the influence of gravity, usually due to prolonged precipitation over unstable slopes.

LATITUDE – The angular distance north or south of the equator of a point on the Earth's surface, measured in degrees, minutes, and seconds through ninety degrees in either direction.

LINGUISTIC MINORITY – Human group or single individual whose native tongue differs from that generally spoken in a given country.

LONGITUDE – The angular distance on the Earth's surface between the meridian passing through a given point and the prime or standard meridian which passes through the Observatory at Greenwich, London, England, measured in degrees, minutes, and seconds up to 180 degrees east or west of the prime meridian.

MANGROVE – Plant community consisting of hydrophilous evergreen species which grow along the coast in wet tropical climates, often at the edge of forest areas, and are characterized by partly submerged adventitious aerial roots.

MAQUIS – Mixed scrub vegetation consisting of xerophytic, broad-leaved evergreen shrubs and small trees occurring in areas with a dry Mediterranean climate.

MARINE TERRACE – Step interrupting the continuity of a coastal escarpment, whose surface (remnant of a preexisting wave-cut abrasion platform) can preserve ocean deposits (sand, gravel, fossils) attesting to an earlier sea level, as also fairly often evidenced by the presence of excavated caves at the base of the cliffs.

MARKET – Place where commodities and services are bought and sold or, in a figurative sense, complex of relations between producers and consumers representing supply and demand and thus determining the price of the pertinent commodities and services (see exchange).

MEANDER – River loop that forms, usually in a series, in a flat stretch of a relatively sluggish watercourse, characterized by intensified erosion of the bank on the concave side and a build-

up of deposits on the convex side.

MEGALOPOLIS – Very large urban complex formed by several urban agglomerations that have spread to the point where they become linked in various ways (as the megalopolis on the northeastern seaboard of the United States stretching from Boston to Washington).

MERIDIAN – One of the lines of longitude of the Earth that link the North and South Poles and intersect the equator at a right angle.

MESTIZO – Term used in Latin America to describe a person of mixed American Indian and European, usually Spanish or Portuguese, ancestry.

METALLIFEROUS VEIN – Materials of magmatic origin which entered a rock fissure or crack while still in a molten state and then consolidated, forming metal ores.

METROPOLIS – Generic term for a major city together with its suburbs, nearby towns, and environs over which it exercises a commanding economic and social influence.

MINORITY – Human group or individual differing in ethnic origin from that of the predominant group in a given community.

MOFETTE – A small opening emitting carbon dioxide in an area of late-stage volcanic activity.

MORAINE – An accumulation of glacial drift deposited chiefly by direct glacial action and possessing initial constructional form independent of the floor beneath it.

MOUTH – Terminal section of a watercourse where all entrained materials are deposited (see also delta, estuary).

MULATTO – Person of mixed Negro and Caucasian ancestry.

MUNICIPALITY – Self-governing administrative community under the jurisdiction of the laws of the state whose representative organs are periodically elected by its inhabitants.

NATIONAL PARK – A protected area designated and managed directly by a national government for the preservation of the natural environment, including one or more ecosystems of special scientific, educational, and recreational interest, as well as of great scenic beauty. To be recognized as a national park, its features must be approved by the International Union for Conservation of Nature and Natural Resources.

NATURE PARK – Generic designation for an area managed for the protection and preservation of the natural environment or for its scientific or scenic interest; a distinction is made among nature parks between regional and national parks (*q.v.*), nature preserves (*q.v.*), and wildlife refuges as well as wetlands (*q.v.*).

NATURE PRESERVE – Area of land or water of special naturalistic and scientific interest that is protected for the purpose of preserving certain animals and/or plants; nature preserves can be general (complete protection of the environment) or specific (protection limited to well-defined objectives and situations).

NEW TOWN – Comprehensively planned, self-sufficient urban community recently established to relieve population pressures in overcrowded cities and including residential, industrial, and commercial districts as well as educational and recreational facilities.

NOMADISM – Mode of life of populations that travel from place to place, living in tents, in search of sustenance for their herds of grazing animals.

OASIS – Isolated fertile area, usually in the midst of a desert, with a water supply furnished by local underground springs or groundwater and sufficient to support permitting plant growth (palms) and cultivation possibilities; water can also be present from a river crossing an arid region (e.g., the Nile valley or Mesopotamia).

ORGANOGENIC – Property of a rock or sediment derived from organic substances.

OROGENY – All of the tectonic phases involved in mountain-building (folding, faulting, and thrusting); an orogeny usually marks a particularly important stage in the evolution of the Earth's crust.

OZONE – Gas present (in the triatomic allotrope of oxygen, i.e., O_3) in the upper atmosphere, generally from 10–35 mi [15–60 km] above the Earth (stratosphere), where it forms by the action of solar radiation on oxygen and fulfills the important function of absorbing harmful ultraviolet radiation from the Sun.

PACK ICE – Aggregation of ice forming on the surface of the sea in polar regions due to the temperature of the water dropping below the freezing point.

PAMPAS – Temperate climate plain in southern South America covered with grasses.

PARALLEL (OF LATITUDE) – An imaginary circle on the Earth's surface formed by the intersection of a plane orthogonal to its axis of rotation and parallel to the plane of the equator. Because the Earth is a spheroid, the width of the parallels varies from a maximum at the equator to a mere point at the poles. Parallels also intersect orthogonally with the meridians, forming with them a grid of spherical trapezia of decreasing size from the equator to the poles.

PASS – A topographic depression in a mountain range providing a passageway between the two opposing slopes.

PASTURELAND – Area of open vegetation in a temperate climate, consisting predominantly of grasses for grazing.

PEAT – Organic fuel consisting of light, spongy vegetable matter in an advanced stage of decomposition; found in marshy or boggy soils in temperate humid environments.

PENEPLAIN – A base-leveled, almost featureless, plain of nonalluvial origin produced by prolonged erosion at the expense of preexisting relief.

PERMAFROST – Perennially frozen ground, occurring wherever the temperature remains below 0°C for several years, whether the ground is actually consolidated by ice or not and regardless of the nature of the rock and soil particles of which the Earth is composed.

PLATE – See tectonic plate.

PODZOL – Ash-colored zonal soil typical of cold to temperate moist climates whose characteristics accommodate mixed vegetation consisting sometimes of heath, sometimes of coniferous forests.

POLAR CIRCLE – One of the two parallels of latitude (Arctic Circle and Antarctic Circle), each 66° 33' distant from the equator; they indicate the location of the points on the Earth's surface where the Sun's rays strike tangentially when they are directly perpendicular to the tropic (*q.v.*) of the opposite hemisphere.

POLDER – Low-lying land, usually below sea level, near the northwest coast of Europe (Netherlands) reclaimed from the sea

by embanking with protective dikes followed by drainage and intended, after salt removal, for cultivation and settlement.

POLLUTION – Alteration or degradation of the physical conditions of the environment affecting, in particular, human and other organisms, caused by the release into the atmosphere, water, or soil of solid, liquid, or gaseous residues and waste materials, such as smoke, exhaust fumes, and radioactive particles.

PROTECTED AREAS – Areas of the Earth's surface identified by their special environmental characteristics and scientific interest and which are therefore placed under the protection of the state and public or private organizations (see also nature park, national park, nature preserve).

PROTECTORATE – Dependent political unit under the management and protection of a larger and more powerful state, especially in the areas of defense and diplomatic representation, with the protected state retaining some of its national sovereignty and other prerogatives under international law.

PROVINCE – An administrative area, sometimes partly autonomous, within a country; intermediate between the local units (municipalities, districts, etc.) and the central state.

RAPIDS – Turbulent flow of a river's current resulting from a variation in the slope of the stream bed which is gentler than that of a waterfall or cascade (*q.v.*).

RESOURCE – Natural substance or organism that may be depleted and is nonrenewable (petroleum, gas, mineral, and other deposits) or that is sustained or increased by specific human activity (agriculture, animal husbandry, industry, etc.) and used to satisfy human needs, including the economic development of the community.

RIA – Coastal indentation (estuary or inlet) that occurs at a river mouth and is formed by the submergence of the lower portion of the river valley.

RIVER TERRACE – A level surface in a river valley flanking and parallel to the river channel and above the river level, representing the uneroded remnant of a former floodplain or river bed.

SADDLE – Depression along a mountain range connecting two higher elevations or a low point in the crestline of a ridge that may or may not afford a pass (*q.v.*).

SANDBAR – Bank of sand that forms in shallow water at a short distance from the coast or at estuary mouths due to the accumulation of materials by the action of ocean currents or swells.

SAVANNA – Tropical or subtropical grassland characterized by scattered trees (often acacia) and mainly xerophytic shrubs.

SCRUB – A tract of land covered with a generally thick growth of dwarf or stunted trees and shrubs and a poor soil.

SEBKHA – Shallow depression found along the coast of northern Africa which becomes marshy during the rainy season until evaporation leaves an often flat, saline plain; very similar to a chott (*q.v.*)

SERVICE (or TERTIARY) SECTOR – Sector of the economy that creates services rather than tangible assets and includes banking, insurance, transportation and communications, wholesale and retail trade, and professional, consumer, and government services.

SETTLEMENT – Any form of human habitation; settlements can be sparse or concentrated, urban or rural, permanent or temporary.

SHANTYTOWN – Residential area on the periphery of a large city, typically seen in highly urbanized Third World countries and characterized by precarious housing crudely built of makeshift materials (metal sheets, wood, plastic, etc.)

SMOG – Term combining the words "smoke" and "fog"; used to describe a mixture of tiny solid particles and water droplets suspended in the air and constituting the major elements in atmospheric pollution (*q.v.*), often occurring in extended built-up areas as a result of emissions from industrial plants, household equipment, and internal-combustion engines.

SNOW LINE – The mean altitude relative to sea level above which snow does not melt but accumulates as permanent ice and forms glaciers. This line varies with latitude from the equator, where it exceeds 16,500 ft [5000 m], through the temperate zones (8000–10,000 ft [2400–3200 m]) to the polar areas, where it drops to sea level.

SOLFATARA – A fumarole (*q.v.*) from which sulfurous gases are emitted.

SPRING – Surfacing of water from an underground aquifer (*q.v.*) or natural discharge point of subterranean water directly into the bed of a stream, lake, or sea.

STATE – Political organization juridically constituted of three basic elements: a territory, a people living in it, and the sovereignty the latter exercises over the former by means of specific forms of government.

STEPPE – Treeless land in a semiarid climate, whether temperate or tropical, consisting predominantly of mixed grassland (alfalfa, sagewood, esparto) or spinous and xerophytic (*q.v.*) vegetation.

STRAIT – A comparatively narrow passage that connects two larger bodies of water and separates the opposite shores of two land areas.

SUBMARINE RIDGE – Symmetrical mid-ocean ridge that rises from the ocean floor and is part of a continuous mountain chain extending about 50,000 mi [80,000 km] through all the oceans of the world; generally formed of volcanic materials, or from the edges of large fractures of the Earth's crust (tectonic plates). Much of the mid-oceanic ridge system is seismically active.

SUBMARINE TRENCH – Deep depression on the ocean bottom at the point of contact between two tectonic plates.

SWAMP – Stagnant water in saturated soil with poor drainage, covered with aquatic vegetation.

TAIGA – Zone of forest vegetation in cold temperate climates consisting of mixed coniferous trees (spruce, pine, larch) as well as broadleaf species (birch) which cover the subarctic regions of North America and Eurasia and the northern limit of which is the 50°F [10°C] isotherm in July. Also called boreal forest.

TECTONIC PLATE – Structural unit of the Earth's crust subjected to vertical and translational (tangential) movements which cause it to collide with contiguous zones, resulting in deformation of their respective margins corresponding to the large systems of mountain ranges that account for the Earth's relief features or to deep ocean ridges, together with the development of intense seismic and volcanic manifestations.

TECTONIC TRENCH – Topographic depression limited by large fractures which have lowered its bottom or raised its margins.

TECTONICS – A branch of geology that deals with regional structural and deformational features of the Earth's crust, including the mutual relations, origin, and historical evolution of the features. Also known as geotectonics.
TEMPERATURE RANGE – Difference between the highest and lowest (mean or extreme) temperatures recorded during any selected period (day, month, year).
TERRITORIAL WATERS – An area of the sea generally 12 nautical miles wide extending outward from the inland waters of a state, over which it exercises direct sovereignty with regard to both the seabed below and the airspace above.
TIME ZONE – One division of the 24 meridian time zones into which the world has been divided on the basis of the local solar time. Each zone is about 15 degrees of longitude wide and the time kept in the area it comprises corresponds, with minor adjustments, to that of the standard central meridian. The succession of time zones is based on their relation to the Greenwich meridian, which determines Greenwich Mean Time (GMT).
TRANSHUMANCE – Form of pastoralism or nomadism organized around the seasonal migration of livestock between the mountainous areas which serve as summer pasturelands and the lowlands used for grazing in winter, following millenia-old itineraries (tracks); transhumance is often practiced today with modern means of transport.
TROPIC – Either of the two imaginary lines circling the Earth at the parallel of latitude of approximately 23° 30', both north and south of the equator, where the Sun's midday rays strike overhead during the June solstice (Tropic of Cancer in the Northern Hemisphere) and the December solstice (Tropic of Capricorn in the Southern Hemisphere).
TUNDRA – Treeless level or rolling ground in polar or high-mountain regions (Arctic tundra or alpine tundra), consisting of plants with a very short growing cycle and supporting dense vegetation of dwarf shrubs (willow), mosses, lichens, heather, etc., which grow in perennially frozen subsoil.
URBANIZATION – Phenomenon of particular economic and social relevance reflected by the tendency of a country's population to concentrate in large urban centers, the outskirts of which, as a result, may expand and/or become especially congested, in some cases with the establishment of shantytowns (*q.v.*).
VERSANT – The connecting area between the bottom of a valley and the summit of a mountain, of variable slope, over which superficial water flows which then collects at the bottom in streams and rivers; mountainside.
WADI – An Arabic term for a usually dry stream bed or channel which carries water only during rare periods of rainfall in the semiarid or desert regions of northern Africa and Arabia and is subject to seasonal flash flooding. The presence of wadis attests to the earlier existence of a highly developed hydrographic system, and hence a more humid climate, during the Quaternary period (Pleistocene epoch).
WATERSHED – Water-parting divide or crest line generally running along mountain ridges and separating two contiguous hydrographic basins (*q.v.*). In American usage, the term also includes the entire catchment area.
WETLANDS – Terrestrial ecosystem characterized by poor drainage and the presence of marshes, bogs, or natural or artificial lakes, and which constitutes the habitat of plant and animal organisms (particularly birdlife) that require specific protection. The characteristics of wetlands were established in 1971 by the Ramsar Convention.
XEROPHYTIC (XEROPHYLOUS) – Relating to plants particularly adapted to live and grow under conditions of scarce precipitation and intense evaporation (as in a salt marsh, saline soil, or acid bog), whose foliation is reduced or transformed to spinous appendices.

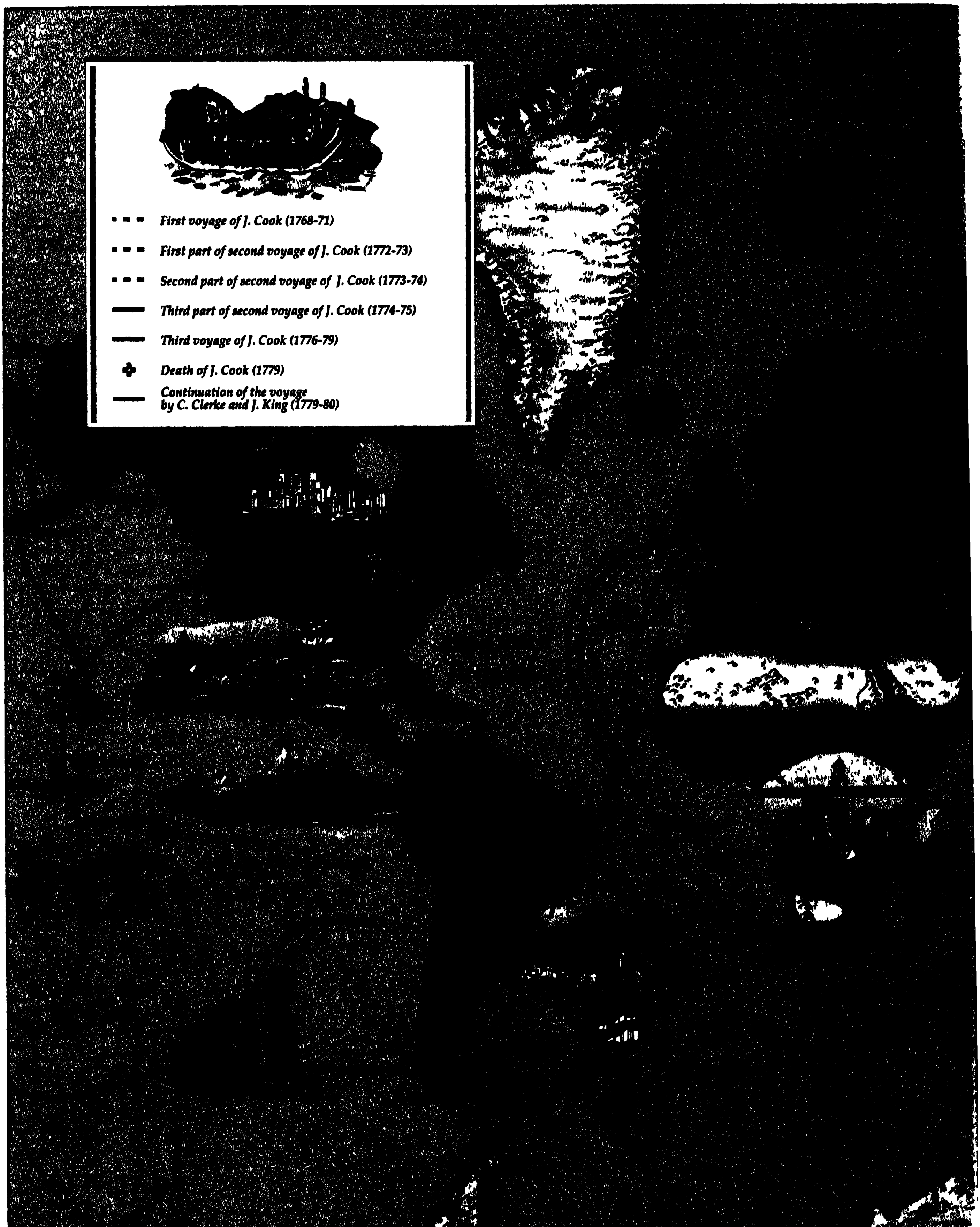
Great Routes and Voyages of Discovery

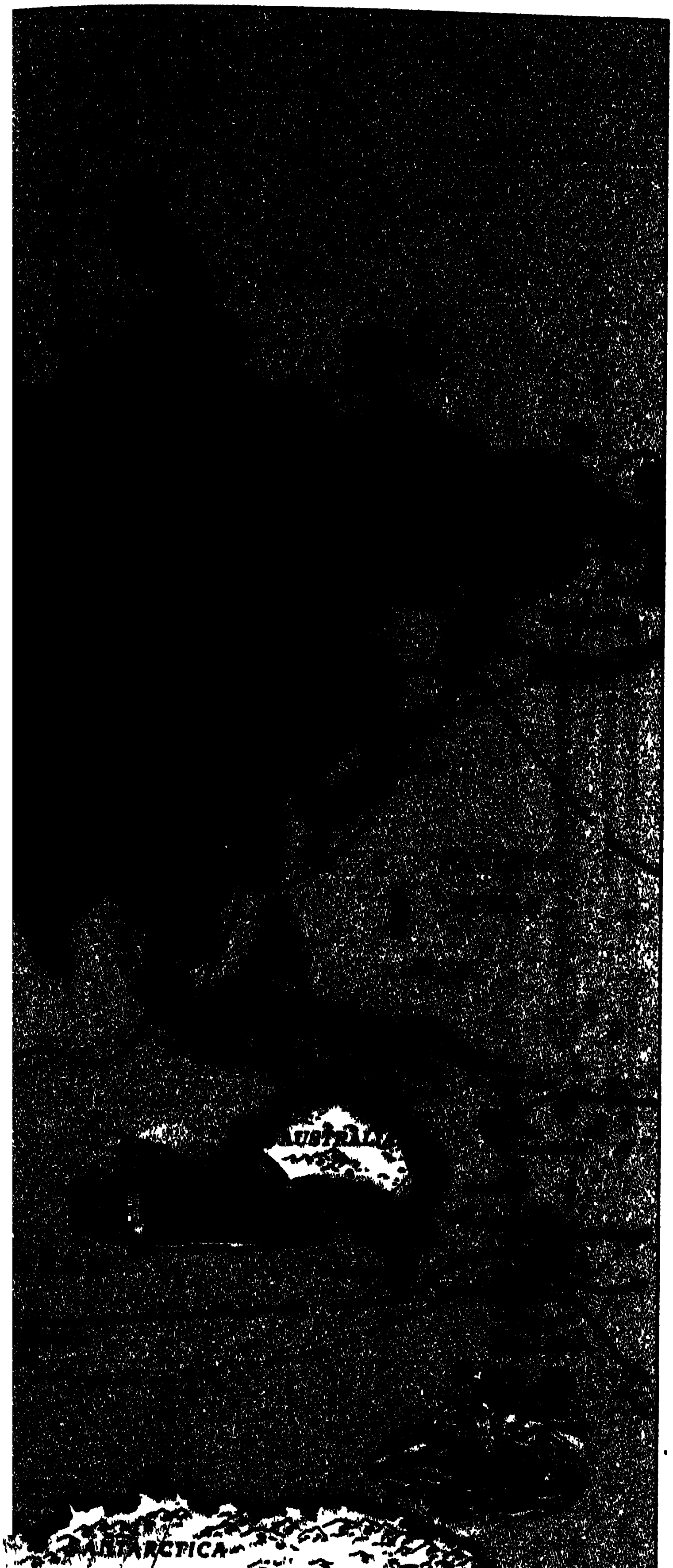

Route of the "Armada of the Moluccas" under the command of F. Magellan (1519-21)
Wreck of the Santiago (1520)
Death of Magellan (1521)
Destruction of the Concepción
Route of the Victoria under the command of J. S. Elcano (1521-22)
Presumed route of the Trinidad (1521-22)
Destruction of the Trinidad (1522)
ATLANTIC OCEAN

MAGELLAN'S CROSSING OF THE PACIFIC

Between 1513 and 1517 Ferdinand Magellan (Fernão de Magalhães) developed his plan to reach the Moluccas not along the established Carreira da India around Africa, but from the west, passing beyond the continent-sized obstacle discovered by Columbus via a southern passage. He submitted his proposals several times to Don Manuel, but the king did not accept them because they were contrary to the interests of Portugal, meaning that he wanted to protect the spice routes already in existence around the Cape of Good Hope. This rebuff led Magellan, like Columbus before him, to turn to Portugal's direct competitors in colonial expansion, namely the kings of Castile. On October 20, 1517, in Seville, he became a subject of Charles I of Spain, (later Charles V of the Holy Roman Empire). A royal capitulation of March 1518 named him captain general of the expedition.

On September 20, 1519, the five ships of the Armada de Molucca (Trinidad, San Antonio, Concepción, Victoria, and Santiago) departed from Sanlúcar de Barrameda. The expedition's route is known primarily from the Chronicle of the first voyage around the world written by Antonio Pigafetta of Vicenza, which reveals Magellan's excellent qualities as a mariner and a commander. After calling at the Cape Verde islands, the ships wintered (March 1520) at Puerto San Julian on the coast of Argentina. The voyage continued, with the loss of the Santiago by shipwreck, along the coast of South America. On October 21 the Cape of the Eleven Thousand Virgins was sighted, the mouth of the long-sought channel leading to the East. While passing through the strait the San Antonio deserted and returned to Seville; the other ships entered the Pacific on November 28, 1520, sailed up the Chilean coast, and having arrived at 32° or 34° S latitude, set out to the northwest, finally reaching the island of Guam on March 6, 1521. From Guam the fleet reached the Philippines (first called the Islas de San Lazaro), where Magellan got involved in local wars and, during one encounter on the island of Mactan, was killed on April 27, 1521. The Concepción was abandoned and the two remaining ships began to wander in search of the Spice Islands, which they found in November 1521. The Spaniards took on spices at Tidore, but the possibility of being intercepted by the Portuguese led them to divide the goods. The Trinidad attempted to return via the Pacific, but after several fruitless attempts had to give up and was captured by the Portuguese; the Victoria, with Pigafetta aboard and under the command of Juan Sebastián de Elcano, returned around the Cape of Good Hope, but following a route different from the Carreira da India. On September 6, 1522, the 18 survivors on the Victoria set foot on land after the first circumnavigation of the globe.


First voyage of J. Cook (1768-71)
First part of second voyage of J. Cook (1772-73)
Second part of second voyage of J. Cook (1773-74)
Third part of second voyage of J. Cook (1774-75)
Third voyage of J. Cook (1776-79)
Death of J. Cook (1779)
Continuation of the voyage by C. Clerke and J. King (1779-80)



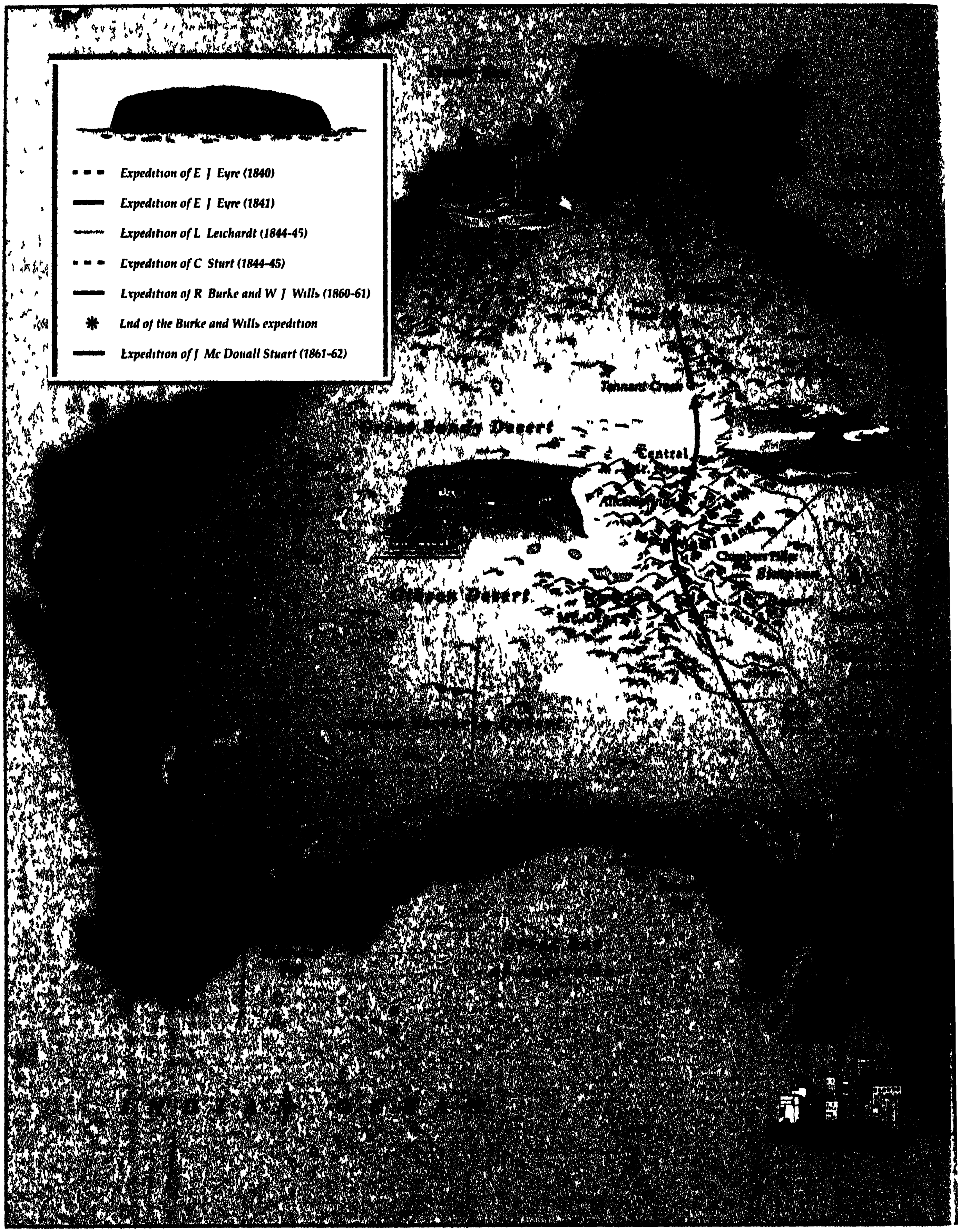
James Cook's Voyages to Australia

The voyages of James Cook (1768–79), like the earlier expedition of Louis Antoine de Bougainville (1766–69), were part of the new spirit of global exploration that emerged in the century of the Enlightenment, impelled by a blend of scientific inquiry and geopolitical interest in world domination.

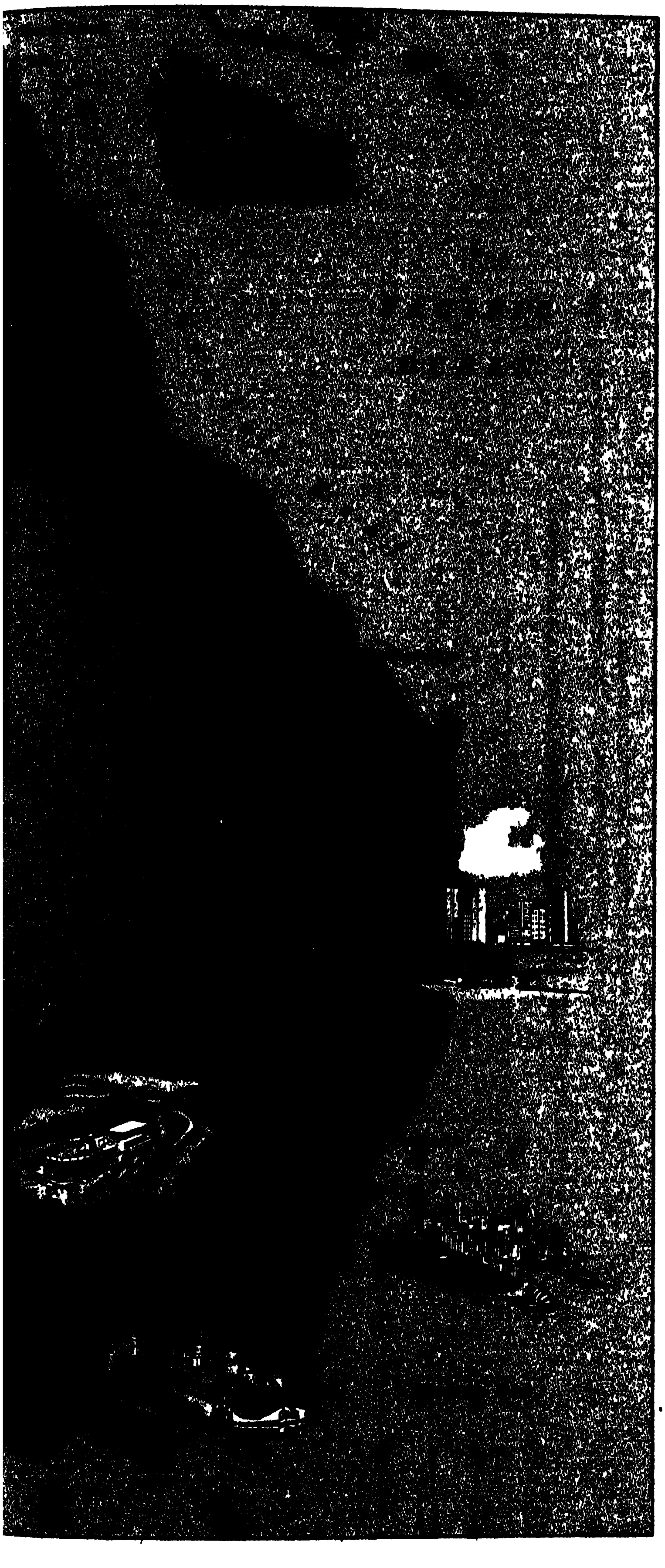
The main scientific purpose of Cook's first expedition (1768–71), organized by the Admiralty and the Royal Society, was to observe the transit of Venus across the sun; the political goals, however, included oceanic reconnaissance that would allow England to compete with France in securing strategic positions in the Southern Hemisphere. The most important results, in addition to contact with the populations of Tahiti where the astronomical observation base was established, were the circumnavigation of New Zealand and the discovery that it consisted of two islands, the exploration of part of the Australian coast (where Sydney would later be established), and the confirmation that Australia and New Guinea were two separate land masses.

The purpose of the second voyage (1772–75) was to get as close as possible to the South Pole to determine whether any large continents or islands existed there. Cook thus became the first explorer to penetrate beyond the Antarctic Circle, and continued to about 70° S latitude where he was halted by pack ice and icebergs. During the first part of the voyage he concluded that if an Antarctic continent existed, it lay at such extreme latitudes that it would be of no economic interest. On the return voyage across the Pacific, he discovered the New Hebrides, New Caledonia, and the South Sandwich Islands.

The third exploratory voyage by James Cook (1776–79) was organized to confirm the possibility of a Northwest passage starting from the Pacific. The expedition therefore sailed from Plymouth, rounded the Cape of Good Hope, and after calling at New Zealand and Tahiti, headed for North America, exploring the coast from present-day Oregon to Alaska. In July 1778 Cook's vessels (Resolution and Discovery) entered the Bering Sea, continuing to 70°29′ N where they were halted by ice. Cook decided to postpone his explorations until the following year, and sailed his ships back to winter in the Sandwich Islands. On February 24, 1779, on Hawaii, the largest island of the archipelago, Cook was killed during a skirmish with the natives. The commander of the Discovery, Charles Clerke, nevertheless made one more attempt to find a passage leading from the Pacific to the Atlantic; following the failure of this undertaking and Clerke's own death, the ships returned to England under the command of James King, arriving in August 1780.



Expedition of E J Eyre (1840)
Expedition of E J Eyre (1841)
Expedition of L Leichardt (1844-45)
Expedition of C Sturt (1844-45)
Expedition of R Burke and W J Wills (1860-61)
End of the Burke and Wills expedition
Expedition of J Mc Douall Stuart (1861-62)

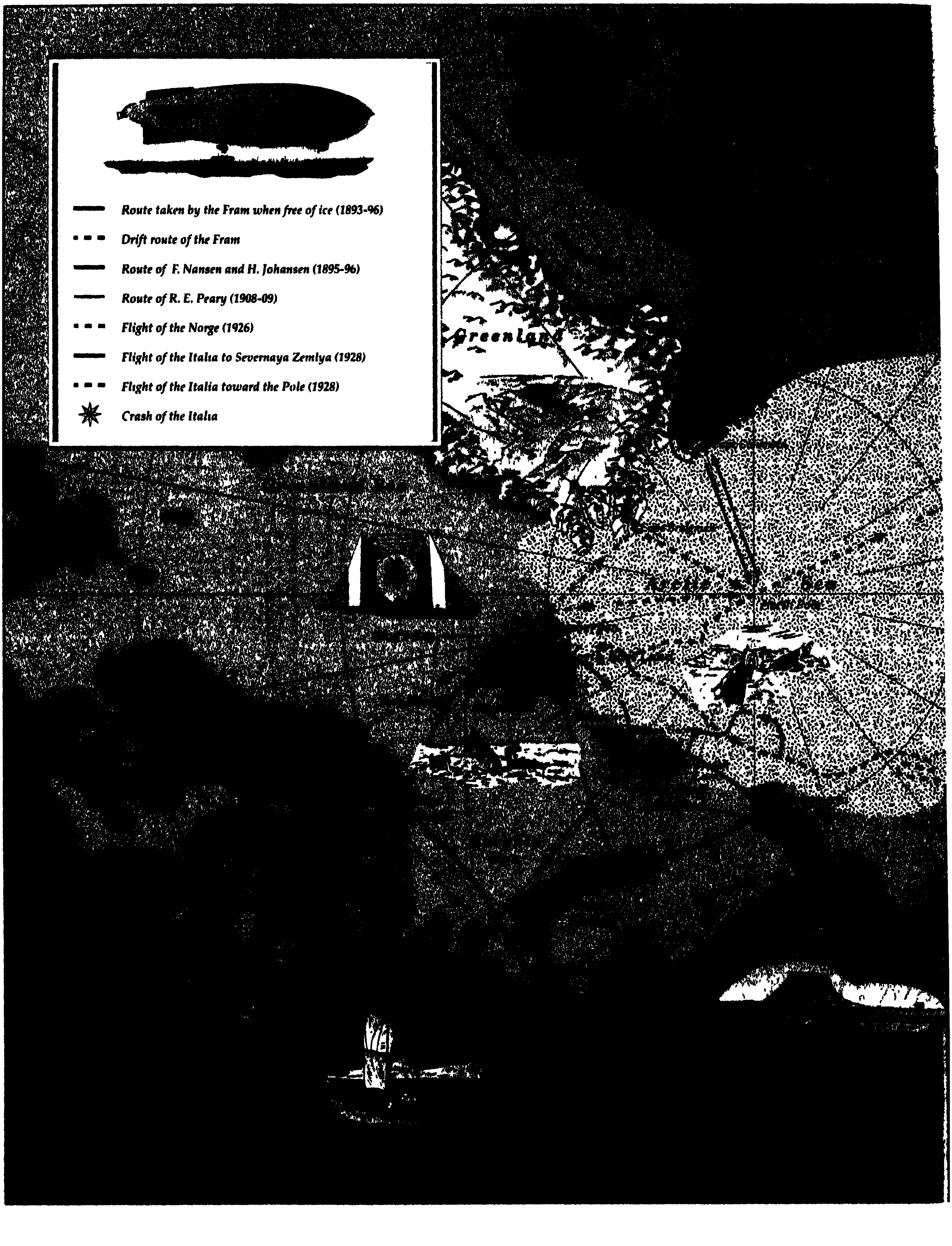


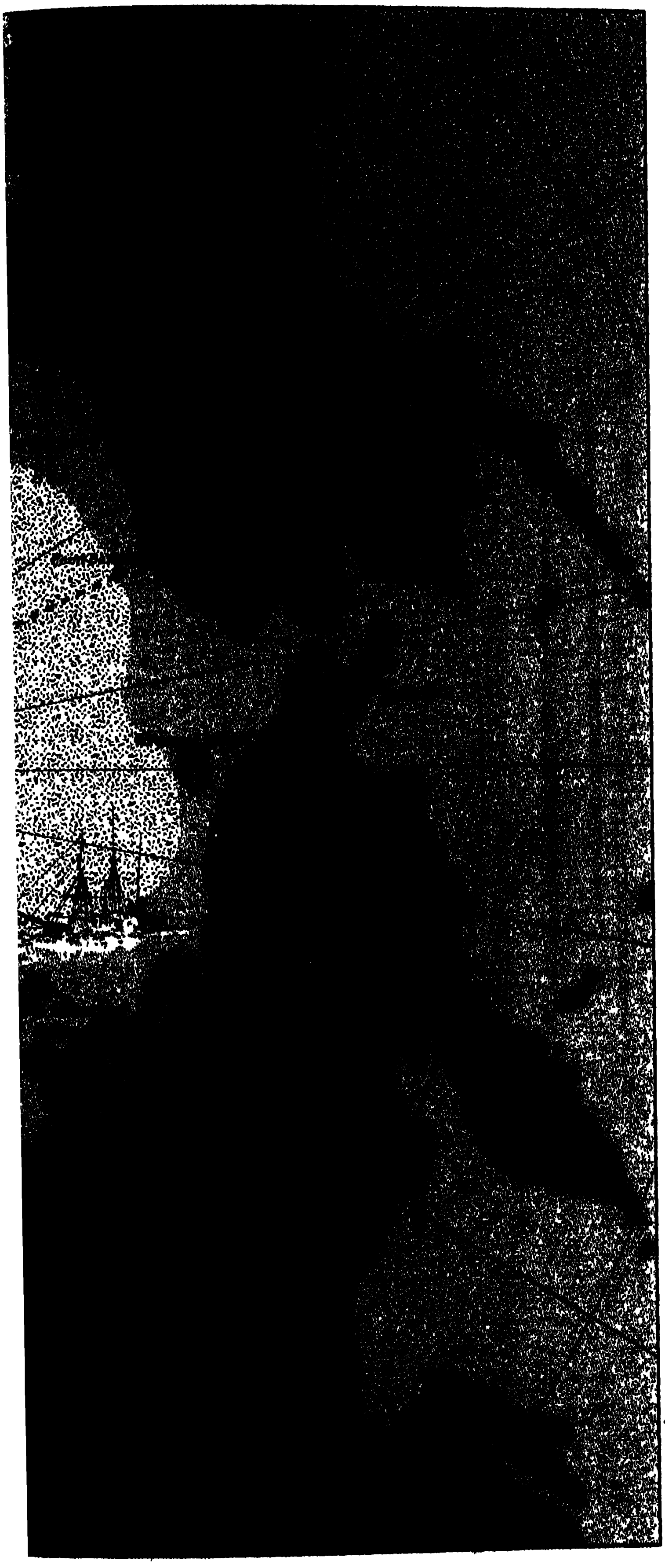
Stuart's Crossing of the Australian Continent

From the European point of view, Australia began to gain importance when England, overburdened with convicts, needed to find an overseas penal outlet as an alternative to North America, which had thrown off the colonial yoke. The results of James Cook's explorations (1768–71) were therefore considered sufficiently promising to start a penal colony that might some day become self-sufficient. Such a colony was established in 1788 at a point not far from Botany Bay, a place explored by Cook, in the inlet called Sydney Cove. The British colony rapidly expanded, at the expense of the native peoples and with the aid of forced labor.

The need for new animal pastures, arable lands, and water resources led the British to organize the first expeditions to the interior, almost always mounted, or at least sponsored, by the colonial government. Each expedition had to struggle against particularly adverse environmental conditions, but it was above all the ability to locate water that determined success or failure.

The first explorer who attempted to cross the entire continent was Edward John Eyre, who set out from Spencer Gulf and attempted to reach the center of Australia, pressing on from there to Port Essington (1840). His expedition did not manage to penetrate beyond what is now called Lake Eyre, but after his return to the coast, the leader explored the extremely arid coastal region. From Fowlers Bay he traveled all the way to Albany, where he arrived almost dead, surviving only thanks to the assistance of an aborigine. The desire to establish a land route between Sydney and Port Essington, regarded as the main port for trade with India, and later the need to build a transcontinental telegraph line, with the lure of a substantial prize for the first person to open up the route, stimulated new explorations of the interior. The most important were those of Ludwig Leichardt (1844–45), Charles Stuart (1844–45), and Robert O'Hara Burke and William Hohn Wills (1860–61), which came to a tragic end. Burke and Wills set out from Melbourne and reached the Gulf of Carpentaria, but on their return, due to a series of errors of judgment, only one member of the expedition managed to escape death by starvation. It was the surveyor John McDouall Stuart, who after two failed attempts (1860 and 1861) finally succeeded in crossing the immense continent, reaching Van Diemen Gulf on the north coast on July 24, 1862. Stuart did indeed blaze a trail for installation of a telegraph line which went into operation nine years later, linking south to north and connecting Australia to the rest of the world.


Route taken by the Fram when free of ice (1893-96)
Drift route of the Fram
Route of F. Nansen and H. Johansen (1895-96)
Route of R. E. Peary (1908-09)
Flight of the Norge (1926)
Flight of the Italia to Severnaya Zemlya (1928)
Flight of the Italia toward the Pole (1928)
Crash of the Italia
Greenland



The Arctic Route (Nansen and Nobile)

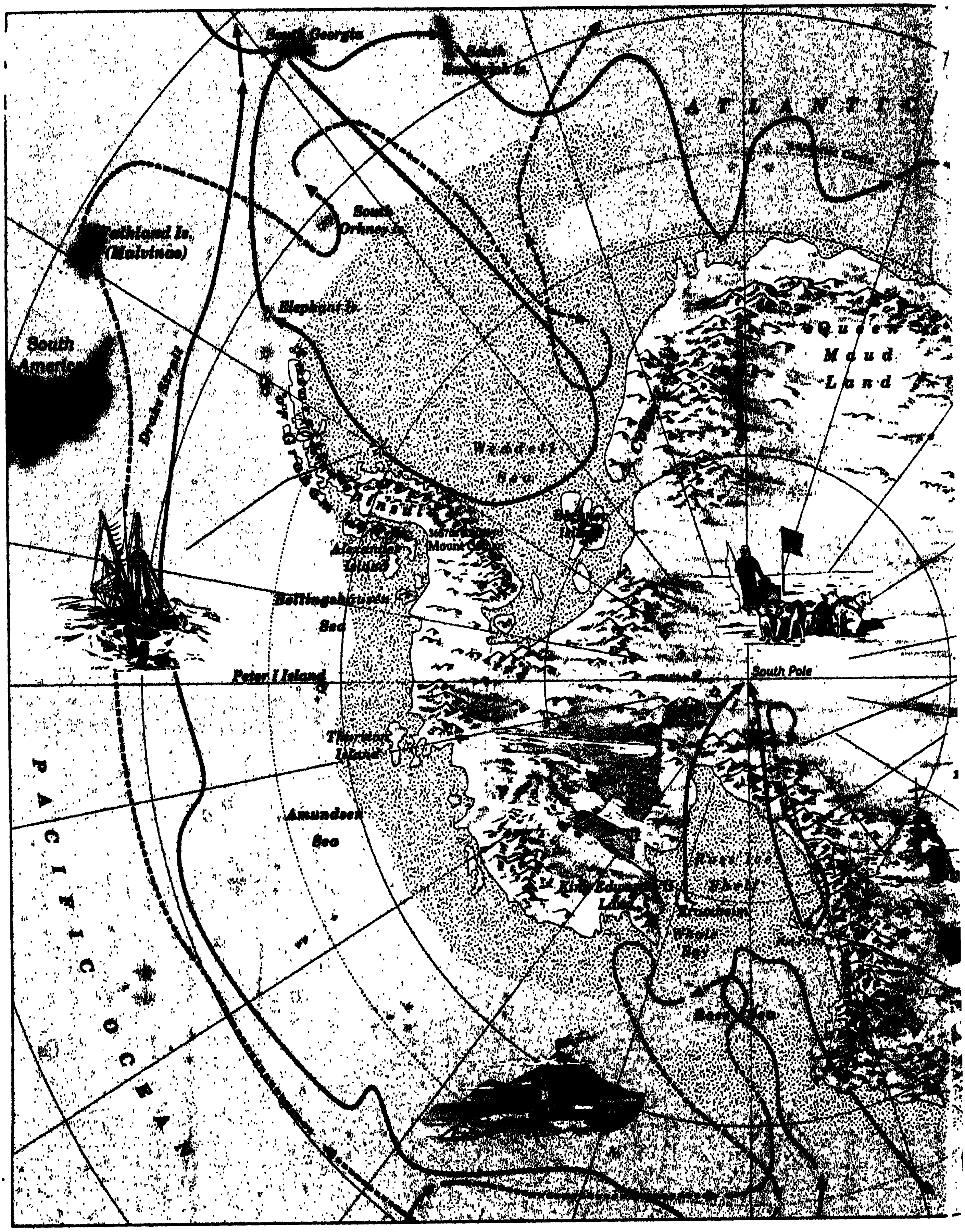
Until the 19th century, exploration of the polar regions was driven by the search for routes connecting Europe with Asia via southwest, northwest, or northeast passages.

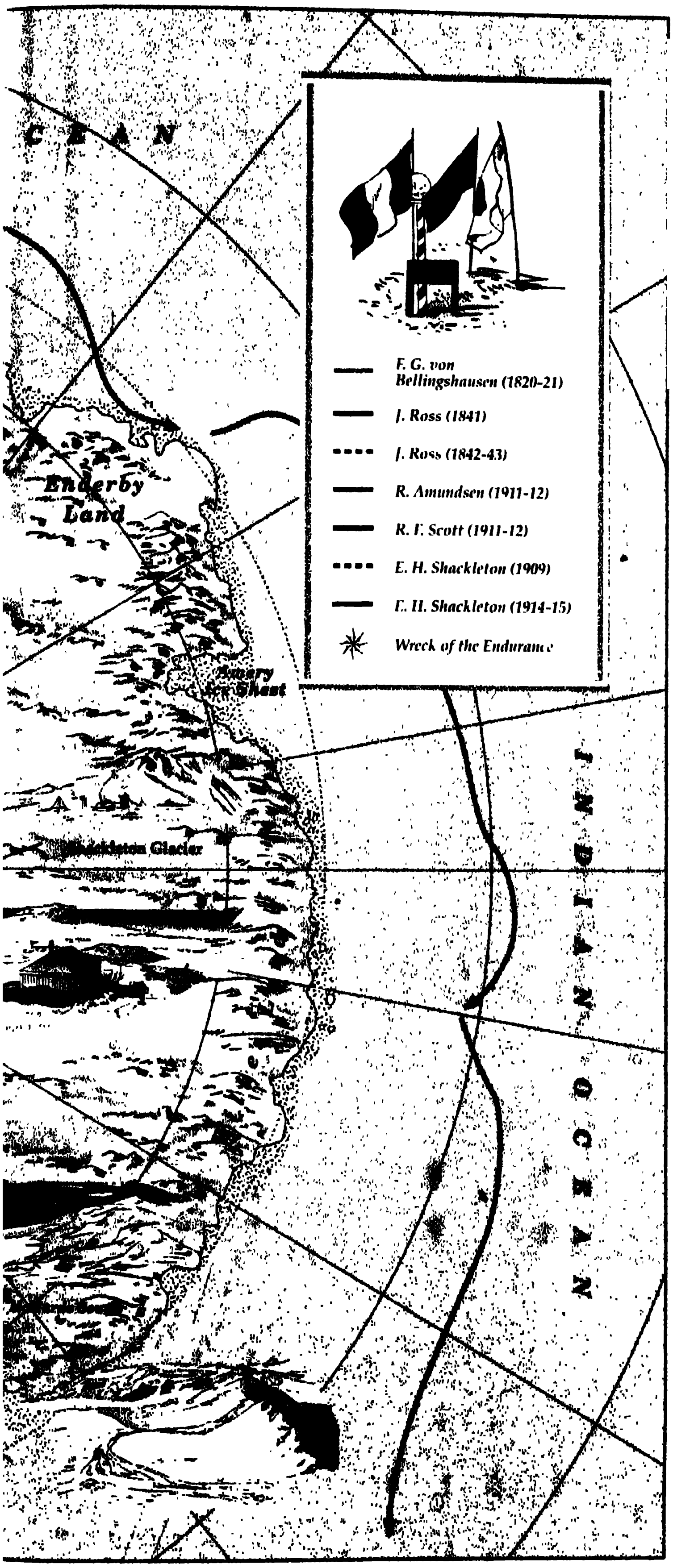
From 1879 to 1881 an American expedition, led by George Washington de Long, attempted to reach the North Pole by sea on the steam yacht Jeannette. The ship was trapped in ice and its occupants died of hunger. Traces of this expedition were discovered in Greenland, suggesting to the Norwegian explorer Fridtjof Nansen that polar currents moved from the coasts of Alaska and Siberia toward Greenland. He concluded that the same route could be utilized by a ship built to withstand the pressure of the ice. In June 1893 this ship, christened Fram ("Onward"), sailed from Christiania (Oslo) with a crew of 13 and enough provisions for five years. The Fram was imprisoned in ice at the end of September 1893 near the New Siberian Islands, and thereafter drifted irregularly. At a latitude of about 84° N the pack ice headed westward, carrying them away from the Pole. At this point Nansen and Hjalmar Johansen left the ship with three sleds, 28 dogs, and two kayaks, and headed north; but at about 86°, the most northerly point ever reached until then, they were forced to turn back. The two explorers returned back toward Franz Josef Land; on June 17 they reached Cape Flora, where they met up with the Jackson-Harmsworth expedition which saved their lives.

The first to reach at least the vicinity of the North Pole, however, was the American Robert Edwin Peary, who used Eskimo survival techniques and succeeded in presumably reaching his goal on April 6, 1909.

In 1925 the Amundsen, Ellsworth and Nobile expedition was organized; it was named after its scientific director, chief source of funding, and expedition commander, respectively. The voyage was undertaken using the semirigid dirigible Norge, which lifted off from Rome, reached Svalbard (Spitsbergen), and on May 11, 1926, continued its flight toward the village of Teller in Alaska. The success of the Norge indicated the possibility of using Arctic skies as an intercontinental route.

In 1928 Umberto Nobile tried to repeat this feat with the dirigible Italia. After two reconnaissance flights he made a third voyage which brought the Italia to the Pole, which he flew over for two hours. On the return flight the Italia crashed as a result of ice that had formed on the covering, landing on the pack ice only 180 miles from Svalbard. On impact, some members of the crew were thrown clear onto the ice, while others remained on the Italia. Nothing more was ever heard from the dirigible, but Nobile and most of those who landed on the ice were rescued.


South Georgia
South Orkney Is.
Falkland Is.
(Malvinas)
South America
Elephant Is.
Drake Strait
ATLANTIC
Queen Maud Land
Weddell Sea
Alexander Island
Bellingshausen Sea
Peter I Island
South Pole
Thurston Island
Amundsen Sea
PACIFIC OCEAN
Ross Ice Shelf
Whale Bay
Ross Sea



The Conquest of the South Pole

Captain James Cook earned the distinction of being the first European to sail beyond the Antarctic Circle, which he did three times between 1772 and 1774. It was not until January 19, 1839, however, that two expeditions, one French commanded by Jules-Sébastien-César Dumont d'Urville and the other American under Charles Wilkes, discovered the Antarctic continent; until then only the outer islands had been known.

From 1843 to 1890 no expedition, private or public, approached Antarctica; it was whaling that led to frequent voyages to the region. The Anglo-Norwegian Borchgrevink expedition (1898) succeeded not only in setting foot for the first time in Antarctica, but also in overwintering there despite temperatures consistently far below zero, 75 days of darkness at 71° S latitude, and extraordinarily strong winds.

Between 1900 and 1912 expeditions were organized by Britain, Germany, Sweden, and France. During the 1902 voyage financed by Britain's Royal Geographic Society, Lieutenant Robert Falcon Scott and his party, including Ernest H. Shackleton (who would later become one of the greatest polar explorers), reached 82°17' S latitude and spent the winter at Hut Point, a promontory on Ross Island, one of the Antarctic regions closest to South America

Scott had begun to prepare a new Antarctic expedition in 1907, and set out in 1910. At Melbourne he received a telegram from the Norwegian Roald Amundsen, who informed him of his own intention to head for Antarctica at the same time. In early 1911 Scott succeeded in putting ashore at Hut Point, located west of the 180° meridian. Amundsen, however, found a landing place farther east that was a good 70 miles closer to the Pole, where he set up his well-furnished camp called Framheim. From the two base camps each expedition wanted to head as directly as possible for the Pole. And in fact once they had climbed the coastal escarpment, both found themselves on a plateau that rose gently toward the center. The highest points on the journeys—about 11,150 ft [3400 m] for Amundsen and 10,500 ft [3200 m] for Scott—were not far from the South Pole, which itself lies at an elevation of about 9,200 ft [2800 m]. Amundsen reached it on December 14, 1911, stayed there with four companions for three days, made a 12.5-mile circuit around it "to make sure we hadn't missed it," and returned to base with all his men safe and sound. Scott also reached the Pole in about a month, arriving on January 18, 1912, and finding to his great disappointment that Amundsen had preceded him. The return trip was tragic: all five members of the expedition died. The last three, including the leader, were overcome by a violent storm and bitter cold only a few miles from their base camp; they were found in November of the following year along with their effects which included photographs and journals.

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